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Lawatan Panel Penasihatan Industri ke PPKBSM

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Nibong Tebal, 3 Mei - Mesyuarat Pertama Panel Penasihatan Industri Pusat Pengajian Kejuruteraan Bahan dan Sumber Mineral (PPKBSM) telah berjaya diadakan. Panel Industri terdiri daripada wakil-wakil industri dalam bidang kejuruteraan bahan, polimer dan sumber mineral. Lawatan panel ini merupakan salah satu daripada keperluan Majlis Akreditasi Kejuruteraan Malaysia (Engineering Accreditation Council) untuk memastikan sesuatu program kejuruteraan itu dijalankan seiring dengan keperluan industri-industri yg berkaitan.

Antara tanggungjawab Panel Penasihatan Industri ini adalah untuk: (i) memberi sumbangan pendapat secara aktif dalam penambahbaikan kurikulum yang dilaksanakan oleh setiap program ; (ii) membantu memperkukuhkan hubungan Universiti-Industri. Panel Penasihatan Industri dilantik selama 2 tahun dan akan bermesyuarat sekurang-kurangnya sekali dalam satu sidang pengajian.

Mesyuarat dimulakan dengan pengenalan oleh Dekan PPKBSM mengenai pusat pengajian dan program-program kejuruteraan yang dijalankan. Dekan juga menjelaskan tentang perlaksanaan Pendidikan Berasaskan Hasil (Outcome Based Education) yang bermula pada sidang akademik 2006/2007 ini. Satu taklimat mengenai latihan industri yang wajib diikuti oleh pelajar PPKBSM selama 10 minggu juga diberikan.

Antara perkara-perkara yang dibangkitkan oleh Ahli Panel Penasihatan Industri (APPI) ialah mengenai penekanan skil komunikasi dan penguasaan Bahasa Inggeris di kalangan para pelajar, memperbanyakkan lawatan industri dalam usaha untuk menambahkan pendedahan dan membantu dalam pembelajaran serta menaik taraf makmal dengan kelengkapan moden dan terkini.

Secara keseluruhannya Ahli Panel berpuashati dengan tahap bilik kuliah, makmal dan usaha-usaha pusat pengajian khususnya pensyarah-pensyarah untuk memberikan persediaan yang mencukupi kepada para pelajar sebelum mereka menceburi alam pekerjaaan menurut bidang yang bersesuaian dengan industri.

Profesor Zainal Arifin sedang menyampaikan syarahan umumnya

Syarahan Umum Pelantikan Profesor Zainal Arifin

Nibong Tebal, 14 Jun - Satu syarahan umum pelantikan profesor bertajuk "Seramik: Tamadun, Sains, Teknologi, Kejuruteraan dan Hala Tuju" telah disampaikan oleh Profesor Zainal Arifin Ahmad dari Pusat Pengajian Kejuruteraan Bahan dan Sumber Mineral. Siri syarahan umum USM merupakan satu program yang terancang, sebagai satu usaha penyebaran dan pendedahan ilmu kepada masyarakat.

Profesor Zainal Arifin Ahmad telah dilantik menjadi profesor USM pada Disember 2004. Pengiktirafan beliau sebagai profesor adalah berdasarkan penglibatan cemerlangnya dalam bidang penyelidikan terutama berasaskan bahan-bahan seramik. Di dalam syarahannya beliau telah menyentuh peranan, kepentingan serta sumbangan bahan-bahan seramik di dalam perkembangan tamadun dan peradaban manusia. Menerusi kajian-kajian yang telah dan sedang dijalankan oleh beliau dan kumpulan penyelidiknya, Profesor Zainal Arifin Ahmad merumuskan bahawa masih terdapat banyak ruang dan peluang yang boleh diterokai agar lebih banyak lagi kegunaan baru bahan-bahan seramik dapat dihasilkan.

Syabas dan tahniah daripada semua warga PPKBSM. Diharapkan Profesor Zainal Arifin Ahmad akan terus menyumbangkan idea dan tenaga disamping mengharumkan nama PPKBSM pada masa akan datang. Semoga kecemerlangan ini menjadi contoh kepada warga PPKBSM yang lain dan dapat diteruskan pada masa-masa akan datang.

Sidang Pengarang

Prof. Hanafi Ismail
(Ketua Pengarang)

Ir. Dr. Mior Termizi Mohd Yusof

Prof. Zainal Arifin Ahmad

Dr. Azura A. Rashid

Encik Samayamutthirian Palaniandy

Encik Mohd Nazri Idris

Penolong Pengarang

Mohd Al Amin Muhamad Nor

Muhammad Fitri

Delegates of the 8th. AUN/SEED-NET Field Wise Seminar

AUN/SEED-Net 8th Field-Wise Seminar

Penang, 22 -23 May 2006 - The 8th AUN/SEED-Net Field-Wise Seminar on "Advanced Materials: Processing and Characterization" was held at Holiday Inn, Penang.

For the year 2006, the school had been given another opportunity to organize the Field-Wise Seminar. The working committee was chaired by Assoc. Prof. Dr. Azizan Aziz. The main goal of the 8th Field-Wise Seminar was to continue to exchange experiences and research findings in the host field among the member institutions with the involvement of Japanese Supporting Universities Consortium (JSUC). This seminar was participated by three invited speakers from (JSUC), AUN/SEED-Net secretariat, representatives from Member institutions (MIs), researchers from Host Institution (USM) and AUN/SEED-Net scholars. The seminar was officiated by Deputy Vice Chancellor (Research and Innovation), Dato' Professor Muhammad Idiris Salleh during the conference dinner on 22nd May 2006.

The seminar was attended by 60 participants including from UP (Philiphines), NUS (Singapore), UGM (Indonesia), ITB (Indonesia), KMITL (Thailand), CU (Thailand) and HUT (Vietnam). At the moment, there are more than 15 ongoing research projects being carried out at SMMRE laboratories. The projects revolve around three main research umbrellas; nano materials, biomaterials and advanced materials. In the seminar, the representatives from USM, MIs and AUN/SEED-Net scholars were given opportunities to present their current research findings. Besides oral and poster presentation, a special meeting was held during the seminar to discuss the implementation plan including continual collaborative research activities in Materials Engineering Research.

ITEX 2006 and MTE 2006 : SMMRE Lecturers Won 1 Gold, 1 Silver and 2 Bronze Medals

The 5th Malaysian Technology Expo (MTE 2006) was held from February 23 - 25, 2006 at the Putra World Trade Centre (PWTC) in Kuala Lumpur. The expo was organized by Malaysian Association of Research Scientific (MARS), and supported by Ministry of Science, Technology and Innovation (MOSTI) Malaysia in Collaboration with SIRIM and MINT.

At this MTE 2006, 3 SMMRE lecturers had won 1 silver and 2 bronze medals. 1 silver medal was awarded to Profesor Hanafi Ismail and his group for their invention of "From Various Rubber Wastes Into Multifunctional Adhesive (MFA) : A Novel Recycling Process". Assoc. Prof. Dr. Khairun Azizi Mohd. Azizli, Professor Radzali Othman and their research groups with their invention of " SiL-An Innovative Mineral Filler for Epoxy Used in Electronic Industry" and "JERA-Ash :Versatile Raw Materials for Glasses, Glazes and Polymers" were awarded bronze medals respectively.

The 17th International Invention, Innovation, Industrial Design & Technology Exhibition (ITEX 2006) was held at Kuala Lumpur Convention Centre (KLCC), Kuala Lumpur from 19 -21 May 2006. Profesor Zainal Arifin Ahmad and his group had won the gold medal for their excellent invention "Ceramic-Metal Cutting Tool Produced Via Friction Welding".

Presentation by an invited speaker during Polymeric Short Course

A Short Course On Polymeric Materials: Recent Development and Applications

Penang, 13-14 February 2006- A Short Course On Polymeric Materials: Recent Development and Applications was jointly organized by SMMRE, Plastics and Rubber Institute of Malaysia (PRIM) Northern region and Institute of Materials Malaysia (IMM) Northern Region. This short course was held at the SMMRE Seminar room and was officiated by Deputy Vice Chancellor (Research & Innovation), Dato' Professor Muhammad Idiris Salleh on 13 February 2006.

This two day short course, emphasised on the recent developments and applications of polymeric materials with the presentations given by representatives from academia and industries. The keynote speakers for this short course were Professor Mohamad Nasir Zainal Arif from Selangor Industrial University (UNISEL) with the topic on "Recent development and application of polymeric materials" and Professor Hanafi Ismail from SMMRE, USM with the topic on "From waste to valuable products: A novel recycling approach". Apart from this two keynote speakers, the short course included other 9 prominent speakers from various polymer background industries.

The objectives of this short course were to provide an understanding of the advantages of polymeric materials and issues in their applications and to give an up-to-date appreciation of the development and application of polymeric materials. This short course provided a platform for researchers, educators, consultants, engineers and postgraduate students involved in the research of development and applications of polymeric-based materials to meet and discuss. There were 100 participants, including industries, government agencies and postgraduate and undergraduate students.

A one day Seminar on Nano Research at USM: Today's Challenges Tomorrow's Opportunities

Nibong Tebal, 22 June 2006 - The "One day Nano Research Seminar which was organized by the NanoMaterials Initiative Group (NanoMIG) of the School of Materials & Mineral Resources Engineering, USM was held at Auditorium Hall, Universiti Sains Malaysia, Engineering Campus. The seminar was officiated by Yang berbahagia Dato' Prof. Muhammad Idiris Salleh, Deputy Vice Chancellor of Research and Innovation on 22nd June 2006. There was such a rich mixture of delegates from both the private and the public sectors comprising of about 90 participants from various Academic Institutions, Research Centers, University Colleges and Companies. There were distinguished speakers in attendance from Accelrys, Japan, Dr. Abhijit Chatterjee, Prof. Kamarulazizi Ibrahim from School of Physics, USM, Mr. Shahrom Mahmud from KDU College, Prof.Madya Dr. Azizan Aziz (SMMRE) and Dr. Sharif Hussein Sharif Zein from School of Chemical Engineering USM. The seminar included presentations from all 6 distinguish speakers and also exhibition booths from several companies (Zugo Photonics Sdn.Bhd., Intran Technologies Sdn. Bhd., Virtual Tech Consulting Sdn. Bhd, Cadence Technologies Sdn. Bhd., QS Instruments Sdn.Bhd and Koperasi USM. Other postgraduates and researchers participated in poster sessions.

The objectives of the seminar were to create opportunities for technical professionals, academicians and research students to exchange knowledge, ideas, information and to share achievements and contributions. Knowledge generation is crucial as it is the precursor to technological innovation. The final core ingredient to a K-Malaysia is having a culture of lifelong learning, of managing and using knowledge and of innovation and entrepreneurship.

And most importantly, through the One Day Seminar, it had helped to create the professional networking, that is, to foster professional friendship and research platform for all to share, learn and pursue new knowledge and experiences with one another. Through this Seminar, we also hope that the synergy and sharing of ideas will lead to new initiatives that will enhance the development of research in Nanoscale Science and Nanotechnology Education in Malaysia.

Call for Papers EMSM 2006

INTRODUCTION

The 15th Scientific Conference & 16th Annual General Meeting of Electron Microscopy Society of Malaysia will be held during December 4-6, 2006 at Sutra Beach Resort, Merang. Research contributions and review articles will be considered for presentation in the following related areas of Material, Metallurgical, Biological and Medical Sciences. The focus are:

1. Scanning Electron Microscope
2. Transmission Electron Microscope
3. Laser and Confocal Microscopy
4. Light Microscopy- Flouresence/DIC
5. Electron Spectroscopic Chemical Analysis
6. Low Energy Electron Diffraction
7. Specimen Preparation Techniques

Participant representing various industries and organization including universities, government sector, private sectors and non-governmental organization (NGOs) are expected to participate in the electron microscopy conference.

Submission of Abstract

Abstract including title, author(s), text and figure (if any) should be confined to one page (A4 size paper). The abstract should be typed in single spacing, Tahoma (11 font). The abstract could be submitted by email attachment at emsmkustem@yahoo.com and emsm2006@kustem.edu.my or by postal service to the Secretariat EMSM2006.

Important Dates

15th September 2006 : Deadline for abstract submission
30th September 2006 : Notification of abstract acceptance
31st October 2006 : Full paper submission

Fees

Members : RM400,
Non Member : RM 500,
Student : RM300,

Further Information

The Secretariat
15th EMSM 2006 Conference
Institute of Oceanography
Kolej Universiti Sains dan Teknologi Malaysia
Mengabang Telipot
21030 Terengganu, Malaysia
Tel: 609-6683195/3123/3546/3107 /33555/3384
Fax: 609-6692166
Email: EMSM2006@kustem.edu.my/ or EMSMkustem@yahoo.edu.my/

Website:
http://www.kustem.edu.my/EM/index.html

Sebahagian ahli keluarga staf PPKBSM bergambar kenangan di Cameron Highlands

Hari Keluarga PPKBSM

Jun 2006 - Kelab Sukan dan Rekreasi PPKBSM dengan kerjasama Jawatankuasa Kampus Sejahtera sekali lagi telah berjaya menganjurkan hari keluarga pusat pengajian di Cameron Highlands. Acara ini telah berjalan selama dua hari dan dipengerusikan oleh Dr. Azhar Abu Bakar. Program ini telah berjaya membawa warga pusat pengajian bercuti sambil beramah mesra di samping mengikuti pelbagai aktiviti yang telah dirancang. Antara tempat-tempat menarik yang telah dikunjungi termasuklah melawat ke ladang teh Sungai Palas, membeli-belah di pasar malam Brinchang, lawatan ke Taman Agroteknologi MARDI dan beberapa tempat menarik lainnya. Aktiviti-aktiviti seperti ini sekurang-kurangnya mampu meningkatkan motivasi dan menjadi pendorong kepada semua warga pusat pengajian untuk terus maju kehadapan. Keseluruhan aktiviti ini berakhir sekitar pukul 2.00 petang hari berikutnya.

Ucapan Tahniah kepada Staf PPKBSM Yang Dinaikkan Pangkat ke **Pensyarah Kanan**:

1. **En. Tuan Besar Tuan Sarif**
2. **Dr. Hazizan Md. Akil**
3. **Dr. Mariatti Jaafar @ Mustapha**
4. **Dr. Norlia Baharun**

Ucapan Tahniah kepada Staf PPKBSM Yang Mendapat **Anugerah Perkhidmatan Cemerlang Tahun 2006**

1. **Dr. Nurulakmal Mohd. Sharif**
2. **Dr. Kamar Shah Ariffin**
3. **En. Mohd. Nazri Idris**
4. **En. Abd. Rashid Selamat**
5. **En. Mohd. Shahid Abd. Jalal**
6. **Pn. Norhaizan Mahamad Shari**

A Short Course in Blasting and Explosives Technology

Nibong Tebal, 30th June 2006. A short course on Blasting and Explosive Technology was held at the School of Materials and Mineral Resources Engineering. There were 19 participants. Those attended were from the quarrying industries and government agencies. The Government Departments such as the Department of Environmental, Department of Occupational Safety and Health and the Police were also present. The staff of School of Materials and Mineral Resources Engineering also attended the course.

The speakers were Mr. Bruce Fagan (Australian blasting expert), Mr. Manoh and Mr. Ramesh (General Manager of Orica-CCM) from Orica Explosives, Ir. Look Keman Sahari, the Blasting Consultant and Ir. Dr. Mior Termizi Mohd Yusof, a senior lecturer from the School of Materials and Mineral Resources Engineering. The course covered the blasting techniques used in Malaysia and Australia and the latest innovation in explosives such as the usage of electronic detonators at the mines or quarry or for building demolition. The course was recognized by the Board of Engineers for the Continuous Professional Development (CPD) of 16 hours credit which can be used as part of the training for the Graduate Engineers as well for the Professional Engineers.

The participants were actively involved during the course.This was maybe due to problems that arise in handling and licensing of explosives materials. The Police sent their staff to the course to enhance their understanding of commercial explosives and in a way of trying to understand the problems faced by the quarry operators. The participants were quite satisfied with the course and to some of them this was a sort of an eye opener, and to some this course had wided up their exposures on the usage of the explosives at the mines and quarries.

Workshop on Geology and Mineralogy of Gold Mineralisation.

Nibong Tebal, 28-30 June - This 3 days workshop was designed to provide participants with a broad knowledge on the techniques in identifying and classifying various mineralogy associated with gold mineralisation systems such as mesothermal and epithermal gold. This workshop mainly involved with material preparation and microscopic works and was attended by 9 technical staff members of Penjom Gold Mine, Kuala Lipis Pahang.

The workshop was held on 28-30 June 2006 and inaugurated by Prof Madya Dr Azizan Aziz, Deputy Dean (Research and Innovation). The workshop was coordinated and given by Dr Kamar Shah Ariffin.

Sidang Pengarang Enjinier menjemput semua staf, pelajar dan graduan PPKBSM memberi sumbangan rencana dan pandangan mereka kepada:

Sidang Pengarang Enjinier,
Pusat Pengajian Kejuruteraan Bahan dan Sumber Mineral,
Kampus Kejuruteraan,
Universiti Sains Malaysia,
14300 Nibong Tebal.

The Enjinier Editorial Board invites all staff, students and graduates of the School of Materials and Mineral Resources Engineering to contribute articles and views to: (Articles must be not more than 3 A4 pages font 12 single spacing)

Enjinier Editorial Board,
School of Materials and Mineral Resources Engineering, Engineering Campus,
Universiti Sains Malaysia,
14300 Nibong Tebal.

Mini sukan MIMATES

Feb 2006 - MIMATES dengan bantuan daripada exco sukannya telah berjaya mengadakan mini sukan untuk pelajar-pelajar PPKBSM yang telah diadakan di Komplek Sukan Kampus Kejuruteraan. Antara acara sukan yang telah dipertandingkan adalah kejohanan bola jaring, bola tampar dan bola sepak. Pertandingan ini terbuka kepada semua pelajar PPKBSM bagi menyemai semangat kesukanan di samping menjalinkan silaturrahim antara para pelajar.

HARI SISWI (ladies@eng)

Mac 2006 - MIMATES dengan kerjasama Majlis Perwakilan Pelajar telah Berjaya menganjurkan acara 'Ladies at Engineering' selama tiga hari bermula 10-12 Mac yang lalu. Projek ini hanya dikhususkan untuk siswi-siswi Kampus Kejuruteraan, USM sahaja. Projek yamg merupakan julung-julung kali diadakan ini dilaksanakan selaras dengan perkembangan sosial semasa yang memperlihatkan peranan wanita dalam hampir kesemua bidang sama ada profesional mahu pun sebaliknya. Projek ini diilhamkan bagi membuka mata dan minda para siswi untuk berhadapan dengan arus perkembangan wanita masa kini. Sumbangan daripada pelbagai pihak termasuk agensi kerajaan, swasta dan orang perseorangan turut menjayakan lagi perjalanan projek ini. Pelbagai aktiviti termasuk sukan, sesi ceramah berkenaan pengurusan kewangan, peluang-peluang kerjaya dalam bidang kejuruteraan daripada tokoh-tokoh terkemuka dan berpengalaman dan sebagainya telah berjaya menarik minat kesemua peserta yang hadir. Sehubungan dengan itu, projek ini diharapkan mampu menjadi sumber aspirasi kepada peserta-peserta yang terlibat terutama setelah melangkah ke alam pekerjaan.

Mahasiswa tahun satu turun sekolah

Mac 2006- Mahasiswa-mahasiswi tahun pertama dengan kerjasama MIMATES telah berjaya menganjurkan satu khemah kerja untuk pelajar-pelajar tingkatan empat dan lima di dua buah sekolah dalam daerah Kerian. Kedua-dua sekolah yang telah dikenalpasti ini adalah Sek. Men. Seri Nibong Tebal dan Sek. Men. Lubuk Buntar. Aktiviti ini bertujuan memperkenalkan pusat pengajian kepada pelajar-pelajar luar di samping memupuk semangat pelajar-pelajar untuk terus berjaya dalam pelajaran. Program ini berkonsepkan bahawa setiap pelajar perlu megetahui minat masing-masing dan jenis kursus yang ditawarkan oleh pihak universiti sebelum mereka menjejakkan kaki ke menara gading. Antara penceramah yang dijemput bagi menjayakan program ini adalah Prof. Madya Dr. Radzuan Razali dan Dr. Zainovia Lockman. Secara keseluruhannya aktiviti ini telah berjaya menarik minat hampir keseluruhan peserta daripada kedua-dua sekolah berkenaan.

COPA DE MATERIA 2006

MAC 2006 - Copa De Materia 2006 merupakan pertandingan bola sepak yang telah dianjurkan olah PPKBSM dengan kerjasama MIMATES dan Kelab Ijazah Tinggi. Kejohanan buat pertama kalinya ini muncul kerana demam piala dunia FIFA 2006 yang bakal berlangsung di Jerman. Terdapat lima pasukan yang bertanding terdiri daripada pelajar-pelajar tahun 1 hingga tahun 4 dan pasukan jemputan khas yang dianggotai oleh gabungan pelajar ijazah tinggi dan staf PPKBSM. Kejuaraan telah dimenangi pasukan pelajar-pelajar tahun 1 setelah menundukkan pasukan pelajar-pelajar tahun 3 di perlawanan akhir. Piala pusingan COPA DE MATERIA disumbangkan oleh Prof Madya Dr. Azizan Aziz. Syabas diucapkan kepada semua yang terlibat.

Kejohanan Badminton Berpasukan Tertutup PPKBSM Piala Profesor Dr. Hj. Zainal Arifin Hj. Ahmad

Sebahagian peserta Kejohanan Badminton Berpasukan Tertutup PPKBSM Piala Profesor Dr. Hj. Zainal Arifin Hj. Ahmad edisi kedua bergambar kenang-kenangan

Pada 06 dan 07 Mei 2006, pelajar ijazah tinggi PPKBSM telah menganjurkan Kejohanan Badminton Berpasukan Tertutup PPKBSM bagi merebut Piala Profesor Dr. Hj. Zainal Arifin Hj. Ahmad edisi kedua bertempat di dewan Komplek Sukan, Kampus Kejuruteraan, USM. Kejohanan kali ini telah disertai oleh pelajar tahun akhir Ijazah Sarjana Muda, pelajar ijazah tinggi, staf akademik dan bukan akademik PPKBSM. Sebanyak 7 pasukan yang terdiri daripada 4 pasukan staf, 2 pasukan ijazah tinggi serta 1 pasukan pelajar tahun akhir dan melibatkan seramai 38 pemain telah menyertai pertandingan ini. Kejohanan ini adalah bertujuan untuk merapatkan hubungan silaturrahim dikalangan warga PPKBSM. Di samping itu juga ia bertujuan untuk memilih pemain berkaliber untuk menyertai pertandingan antara Jabatan.

Kejohanan edisi kedua ini telah menawarkan hadiah keseluruhan bernilai RM600.00 dan sehelai T-Shirt untuk setiap pemain. Penaja utama kejohanan kali ini adalah Kulim Hi-Tech Sdn Bhd. Juara kejohanan mendapat piala pusingan, piala iringan, wang tunai dan hamper, tempat kedua hingga keempat mendapat piala iringan, wang tunai dan hamper, manakala tempat kelima hingga ketujuh mendapat wang tunai dan hamper.

Memandangkan pihak penganjur telah mengubah format pertandingan iaitu 2 acara berpasangan dan 1 acara perseorangan untuk edisi kedua ini, ianya telah memberi impak yang besar kepada setiap pasukan. Oleh kerana setiap pasukan mempunyai kekuatan yang seimbang, maka percaturan strategi menjadi pertaruhan terbaik untuk memenangi setiap perlawanan. Selain itu kekuatan mental pemain ketika menghadapi pasukan lawan juga menjadi penentu kemenangan bagi pasukan. Komitmen setiap pasukan untuk memenangi perlawanan adalah amat membanggakan dan ini merancakkan lagi kejohanan edisi kedua ini.

Juara kejohanan edisi kedua ini telah dimenangi oleh Tangkis Eagle yang menewaskan Goosen Power dengan kiraan 2 - 1. Perebutan tempat ketiga dan keempat telah menyaksikan satu pertarungan yang sengit dan mendebarkan antara pasukan Pelajar Tahun Akhir yang bertemu dengan X'Calibur. Perlawanan berkesudahan dengan kemenangan kepada Pelajar Tahun Akhir dengan kiraan 2 - 1. Kejohanan kali ini juga berjaya mencungkil bakat beberapa pemain bagi acara perseorangan yang julung kali diadakan. Pihak penganjur telah memilih En Razak Embi sebagai pemain terbaik kejohanan.

SIJIL DEKAN
PUSAT PENGAJIAN KEJURUTERAAN BAHAN DAN SUMBER MINERAL
SEMESTER II, SIDANG AKADEMIK 2005/06

KEJURUTERAAN BAHAN

Tahun 1
Chiew Yi Ling
Foo Yin Lin Evon
Khoo Li Jian
Koay Hoay Bin
Lai Chin Wei
Lau Yee Chau
Lim Saw Sing
Lim Way Foong
Ng Chai Yan
Yap Hui Chek

Tahun 2
Boon Moon See
Chin Hui Kit
Kenneth Kong Thean Soon
Khor Gaik Hooi
Lee Chen Wen
Lee See Yau
Leong Wei Cheng
Lim Shu Lee
Quah Hock Jin
Sasikumar A/L Arumugam
Tan Shen Mei
Yong Khai Ling

Tahun 3
Chen Peh Sun
Chen Suet Fern
Ch'ng Bee Hwei
Ch'ng Lay Ean
Cho Swee Jen
Eng Siew Tze
Ho Jung Kit
John Paul Wang Sing Siew
Khoor Siang Tian
Khor Siew Cheng
Lee Chee San
Lee Lit Wee
Lee Siew Shyuan
Liew Kein Fee
Loh Poh Lin
Nor Syaidatul Akma Binti Mohd Rasli
Ong Lay Lim
Ong Yee Wei
Ooi Mey Ling
Siew Sok Fun
Tan Kean Beng
Tang Efei
Wong Gar Shen

Tahun 4
Chong Tun Shin
Farah Anis Binti Jasni
Goh Chiou Bee
Ho Kar Fei
Iruwanizudin Bin Shariff
Koay Seong Tak
Kok Yi Seong
Lee See Chin
Lim Eng Chuan
Lim Ling Ching
Lim Shwu Choo
Lim Soo Wah
Loo Huai Sun
Lum Sek Yew
Mohana Pria A/P Rainoo Raj
Mohd Fadhli Bin Ahmad
Mohd Nor Azahan Bin Mohamad
Neoh Eng Suan
Ng Li Sian
Ng Mei Chan
Ng Soo Bee
Noor Rehan Binti Zainal Abidin
Noor Syamiza Binti Abdul Malik
Ong Ghee Mei
Peter Chin Ting Soon
Rosmawati Binti Ariffin
Salwa Suhana Binti Jamil @ Suaid
Soon Li Lian
Tan Cheng Hee
Tan Hoay Yoong
Tan Ruo Yee
Tiong King Hock
Tung Wei Nam
Wong Goon Heng
Wong Pei Pei
Wong Yoong Yoong
Woon Wu Siang
Yap Siew Lin
Yap Soo Chin
Zuraidah Binti Mohd Yasin

KEJURUTERAAN POLIMER

Tahun 1
TIADA

Tahun 2
Phua Yi Jing
Tuan Noraihan Azila Binti Tuan Rahim

Tahun 3
Ho Hui Ling
Ho Kar Wei
Lee Suh Sia
Lim Cheng See
Lim Ee May
Lim Kong Fei
Lim Yuk Thong
Low Lai Ching
Mohana A/P Subramaniam
Raa Khimi Bin Shuib
Tay Hong Kang
Tay Min Min

Tahun Akhir
Chew Siou Lian
Foo Pei Ming
Fua Tai Yee
Hor Khang Yuan
Ku Mohd Syahril Bin Ku Ahmad
Lam Seow Fong
Lee See Yin
Mas Idayu Binti Ramli
Mohd Khairuddin Bin Jailani
Mohd Zharif Bin Ahmad Thirmizir
Ng Lay Ping
Rosmaniza Binti Ibau Nui
Siew Chai Ling
Suganthi A/P Selvathurai
Suganti A/P Ramarad
Syakila Binti Aziz @ Abdul Aziz
Tay Lee Hwa

KEJURUTERAAN SUMBER MINERAL

Tahun 1
TIADA

Tahun 2
Chi Cheng Weng
Kok Chee Weng

Tahun 3
TIADA

Tahun Akhir
Al Izudin Abdullah
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Hariyanto Bin Salleh
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Visitors to the SMMRE (January to June 2006)

NO	DATE	VISITOR	INSTITUTION	PURPOSE
1.	19.01.2006	- Mr. Mohammed E-Souni	IMST, University of Applied Science of Kiel, Germany	Visiting SMMRE
2.	22.02.2006	- Mr. Anuar Fadzil Ahmad - Mr. Al Koedesch	Silterra Malaysia	Discussion with Electronic Group
3.	06.03.2006	- Mr. Ian R. McGeie	ITRI Ltd, St.Albans, London	Research Collaboration with ITRI
4.	13.03.2006	- Mr. Stacy Goldsworthy	Metso Minerals, New Zealand	Collaboration with Mineral Resources Engineering Group
5.	15.03.2006	- Miss Jariyah Hashim	AMD, Malaysia	Visiting SMMRE
		- Prof Ariga Tadashi	Tokai University, Japan	AUN-SEED-Net Research Collaboration
6.	24.03.2006	- Prof. Shahjahan Mridha	UIA, Malaysia	External examiner for Materials Engineering Programme
7.	29.03.2006	- Prof. Jun-ichi Matsushita	Tokai University, Japan	AUN-SEED-Net Research Collaboration
8.	06.04.2006	- Prof. Eric Grimsey	WA School of Mines, Curtin University	External examiner for Mineral Resources engineering Programme
9.	25.05.2066	- Prof Mitsuyu Todo - Prof. Kunio Ishikawa	Kyushu University, Japan	AUN-SEED-Net Research Collaboration
10.	29.05.2006 to 30.05.2006	- Prof.Dr Esah Hamzah	UTM, Skudai, Malaysia	External examiner for Mixed Mode Viva

EFFECT OF JET MILL'S OPERATIONAL PARAMETER ON THE PRODUCT FINENESS

Samayamutthirian Palaniandy, Khairun Azizi Mohd Azizli , Ee Xun Hong, Syed Fuad Saiyid Hashim, and Hashim Hussin

Abstract

The objective of grinding process is to achieve maximum breakage with minimum energy consumption. As fine grinding is known for high energy consumption, the need to optimize the process is very essential and all the possible parameters must be considered to improve the process. In this experimental work, fine grinding of silica was carried out in fluidized bed opposed jet mill by varying the grinding pressure and classifier speed and keeping the feed rate constant. Four level two factor factorial designs were used to carry out this experimental work. Response surface plots were used to optimize the fine grinding process. Ironically, the maximum breakage did not take place at maximum grinding pressure and classifier speed, but at the optimum grinding pressure of 4 bar, and the classifier speed of 10000 rpm.

Introduction

The stringent demand for ultra fine particles in terms of its size, shape and surface texture and the high energy consumption during the fine grinding process have created an enormous interest in the research of fine grinding process. Recently, the quality of the product has been the main criteria for the end user and more stringent specification has been imposed by various parties in order to improve the quality of the product especially in pharmaceutical, manufacturing and food[1,2]. Improvement in the grinding technologies has been remarkably tremendous as the demand is not only concern with the narrow size distribution but also tailor value added mineral with specific requirement such as particle shape and surface texture specifically for certain application[1].

Jet mill is one of the industrial mills that have created the interest due to its capability of producing ultra fine particle with ultra high purity[3,4]. Other advantages of the jet mill are the extremely low wear rate in the mill part that has created the interest to use this mill especially for abrasive materials, small footprint, high degree of fragmentation, low noise and ability to grind heat sensitive materials[5]. Currently jet mill is used to produce particle finer than 10 µm and it is vastly used in pharmaceutical, mineral, agriculture, manufacturing and food industry[2]. The demand for ultra fine particle with high purity is emerging in various industries as mentioned above as filler, extender, pigment and coating materias.The demand has created an interest to optimize the fine grinding process in the jet mill. Careful control of the feed characteristics, design parameter and operational parameter is the key to optimize the energy consumption and the overall operating cost to produce ultra fine high purity particles[5].

Many researchers have focused in fluidized bed oppose jet mill and the work has been focused on optimisation of the operating parameters such as the feed rate, classifier speed and modelling of the mill[6,7]. In fluidized bed jet mill, there is another parameter that needs to be optimised for efficient grinding process, i.e. the characteristics of the fluidized bed. Henri et.al. and Laurence et. al. mentioned that the mass of the fluidized bed is ranged from 200g up to 280g depending on the types of the raw material[6,7]. Thus is an important parameter that needs to be focused to successfully optimize the fluidized bed as oppose to jet mill.

In this experimental work silica was chosen as the raw material for the fine grinding process because it has a tremendous demand as functional and unfunctional fillers, coating agent, abrasive materials and extender in the polymers, paint, coating, ceramics, composites, cement and also surface treatment industries.The amount of fluidized bed in the grinding chamber was measured and characterized in terms of its particle size. The ground product was characterized in terms of its particle size.

Experimental

The experiment was performed in 100 AFG (Aeroplex-Flie bett Gegenstrahlmuhle) of Alpine AG, Augsburg, Germany with an inner diameter of the grinding chamber of 100mm. On top of the grinding chamber was a dynamic classifier Alpine 50 ATP (Alpine Turbo plex) that was installed with a ceramic classifier wheel of 50mm diameter. Figure 1 shows the schematic diagram of the 100 AFG. The performance of the mill was controlled by varying the grinding pressure and classifier speed while the feed rate was kept constant at 8 kg/h. The externally driven classifier runs with a constant speed, independent of the gas phase concentration in the grinding chamber, as long as the classifier did not become overloaded. The grinding process was performed for 20 minutes and then crashed stop at the 30th minute to collect the samples from the grinding chamber and the product bin. Laurence suggested that the 100 AFG will be in steady state operation condition within 15 minutes. The material ground in this experiment was silica from Sibelco Malaysia. The characteristics of silica are given in Table 1.

Table 1: Characteristics of silica.

Moisture content	0.89 %
d_{50}	15.66µm
SiO_2 content	99.00 %

The experiment was designed using the two factor factorial design without replication and the grinding pressure and the classifier speed were varied in four different levels as shown in Table 2. The samples were labeled according to its operational parameter.

The particle size analysis of the feed and the ground product was done in Fritsch Particle Sizer 'analysette 22'.

Results and Discussion

The factorial design for this experiment suggested 16 points each corresponding to the variation of the operational parameter. Figure 2 shows the response surface plots of media particle size (d50) of ground product with respect to grinding pressure and classifier speed. A rapid size reduction was obtained and the median size of the ground product ranged from 4.64 µm to 11.18 µm. The particle size of the ground product was coarse at lower grinding pressure and higher classifier speed. The minimum particle size was obtained at grinding pressure of 5 bar and the classifier speed of 10000 rpm. An interesting phenomenon was the d^{10} and the d^{70} values of the ground product. The d^{10} and the d^{50} values at respective classifier speed did not show significant changes as the grinding

Table 2: Two factor factorial design for experimental work

Classifier Speed (rpm) / Grinding Pressure (bar)	5000	10000	15000	20000
3	*JMS0503*	*JMS1003*	*JMS1503*	*JMS2003*
4	*JMS0504*	*JMS1004*	*JMS1504*	*JMS2004*
5	*JMS0505*	*JMS1005*	*JMS1505*	*JMS2005*
6	*JMS0506*	*JMS1006*	*JMS1506*	*JMS2006*

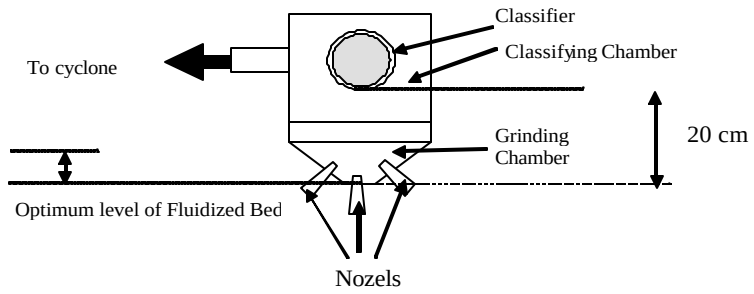

Figure 1: Schematic diagram of 100 AFG

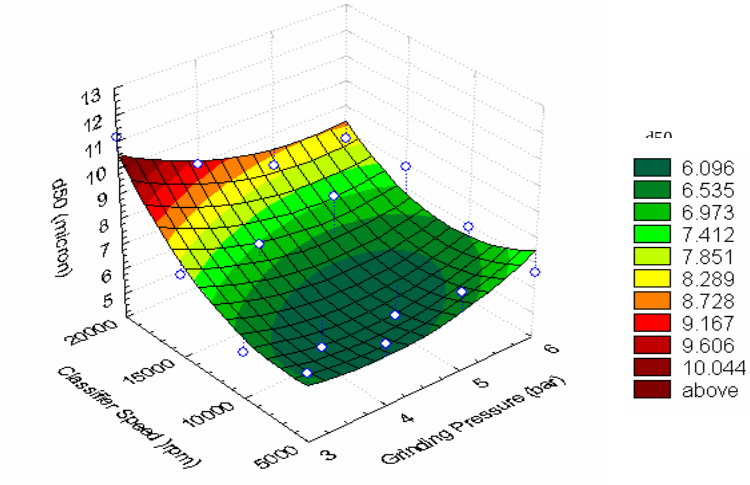

Figure 2: Response surface plots of media particle size (d50) of ground product with respect to grinding pressure and classifier speed.

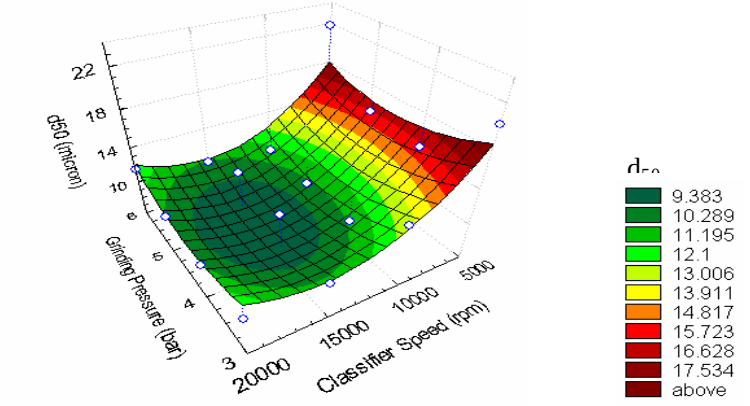

Figure 3: Response surface plots of median particle size (d50) of fluidized bed with respects to grinding pressure and classifier speed.

pressure increased but the d_{70} values was decreasing as the grinding pressure increases as shown in Table 2. This phenomenon may be due to the classifier operation that classify the particle according to their median size. Theoretically, the maximum comminution rate took place when the particle was accelerated at maximum velocity, but at 8kg/h, maximum breakage happened when the grinding pressure was 5 bar. In jet milling process, the generation of compressed air consumed much energy and most of it was used for particle breakage. Reduction in the grinding pressure would reduced the compress air consumption and overall it would reduced the operating cost of the jet mill as lower energy was consumed for maximum particle breakage.

The fineness of the ground product was very much dependent with the particle size distribution, the mass and the height of the fluidized bed in the grinding chamber. Optimization of these three factors would improved the grinding efficiency in the jet mill by controlling the grinding pressure and classifier speed. Higher grinding pressure and classifier speed would not necessary produce finer particles as shown in Figure 2. Figure 3 shows the response surface plots of median particle size (d50) of fluidized bed with respect to grinding pressure and classifier speed. The median particle size of the fluidized bed ranged from 8.5 m to 21.8 m. The response surface showed a minimum particle size when the grinding pressure was around 5 bar and the classifier speed 10000 rpm, where as at other parameters the particle size was coarser. This phenomenon was due to the mass of the fluidized bed in the grinding chamber and feed rate. Although the feed rate was kept constant in this experimental work but there was optimum feed rate for the respective classifier speed and grinding pressure.

Conclusion

Optimization of the fine grinding process is essential as the process consume very high energy. The mass of fluidized bed or its height is an important criterion that needs to be optimized besides the grinding pressure and the classifier speed. The optimum classifier speed and grinding pressure at feed rate of 8 kg/h were 10000 rpm and 5 bar respectively.

Acknowledgement

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EFFECTS OF HEAT AGEING ON TEAR STRENGTH AND CYCLIC CRACK GROWTH BEHAVIOUR OF UNFILLED NATURAL RUBBER VULCANISATE

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Abstract
When natural rubber (NR) is aged in air at elevated temperatures its strength properties are diminished. The effects of accelerated ageing on strength properties were investigated for unfilled NR with efficient vulcanisation (EV), conventional sulphur vulcanisation (CV) tested for aerobic and anaerobic ageing at 100°C. The strength properties were measured using fracture mechanics approach to investigate the intrinsic materials properties. The crack growth measurements were carried out using trouser test pieces for the tear strength or catastrophic tearing and tensile strip test piece for cyclic crack growth tests. Results showed a reduction of catastrophic tearing energy and crack growth rate with longer time of ageing for both curing systems.

INTRODUCTION

Thermo-oxidative ageing of natural rubber (NR) is strongly affected by choice of vulcanisation systems. It is reported in the literature that an efficiently cured vulcanisation (EV) has a great thermal stability due to the predominantly monosulfidic crosslinks in the network [Chapman & Poter 1988]. The major advantage of rubber vulcanised with EV systems is the better resistance to thermo-oxidative ageing. For conventionally cured vulcanisation (CV) with di- and poly-sulfidic crosslinks, which are claimed to have less thermal stability [Porter, 1968]. It has been reported that the advantages of CV systems compared with EV systems are better physical properties such as tensile strength, modulus and elongation at break [Batemann et al, 1963].

The loss in physical properties, associated with ageing processes, is normally caused by chain scission, crosslinking or some form of chemical alteration of the polymer chains [Buist, 1956]. This leads to the loss of physical properties. One possible mechanism for the change in strength is a diminished capability of the aged material to undergo stress-induced crystallisation, a phenomenon that is known to be responsible for the excellent strength properties of NR [Gee, 1947; Flory, Rabjohn and Schaffer, 1949]. Barker [1990] suggested that at high ageing temperatures, network break down, leading to loss of strength, tended to have the dominant influence.

The strength of elastomers can be measured in several ways, such as tensile strength, tear strength, fatigue resistance and abrasion resistance. It was shown for elastomers that the tearing energy could be related to the tensile strength [Thomas, 1955; Greensmith, 1960], and that the crack propagation characteristics of the material governed its tensile strength [Thomas, 1966] and fatigue resistance [Gent, Lindley and Thomas, 1964]. Thus the most fundamental process, determining all these different strength properties, is the resistance to crack propagation. The crack growth in elastomers had been successfully described utilising a fracture mechanics approach based on tearing energy concept [Lake and Thomas, 1988]. In this paper, the effects of accelerated ageing on strength properties ware investigated for unfilled NR with different curing systems that has been subjected to ageing at 100°C.

Materials & Experimental

Standard Malaysian Rubber grade NR with Mooney viscosity stabilized to 60(SMR CV 60) was chosen for its cleanliness and good batch-to-batch reproducibility of viscosity. In order to avoid any inconsistencies within and between compounds, the same bale of rubber was used throughout the investigation. Table 1 gives the formulations used for the investigations. Three vulcanisation systems were used: efficient vulcanisation (EV) and conventional sulphur vulcanisation (CV).

Catastrophic tearing energy

Catastrophic tearing energy was determined using trouser test pieces of dimensions 100 mm in length, 50 mm width and of 0.5 mm thickness, cut to a depth of 40.5 mm in the direction of length. It is important that the last 1 mm of the cut was made using a razor blade. Catastrophic tearing energy (Tc) using trouser test pieces were calculated in accordance with ASTM D624, using median force, F required to propagate the cut by tearing acting in a direction substantially in the plane of cut divided by the thickness of the rubber sheet :

$$T_c = \frac{F}{t} \qquad \text{(Equation 1)}$$

The test was carried out using an Instron 4301 machine at rate of grip separation of 100 10 mm/min resulting in a steadily increasing traction force was applied until the test piece fractured. The force throughout the tearing process was recorded using a chart plotter. The results shown are the averages of 5 different samples.

Table 1: Vulcanisate details

Ingredient*	efficient vulcanisation (EV)	conventional vulcanisation (CV)
SMR CV60	100	100
Zinc oxide	5	5
Sulphur	0.5	2.0
CBS**	5	0.6
Dicumyl peroxide	-	-
Cure time, min @150°C	36	22
Physical crosslink density, unaged mol/m^3	151	139
Physical crosslink density, aged 3d@100°C, mol/m^3	148	155
Crosslink type	Predominantly monosulphide	Predominantly Polysulphide

* numbers give parts per hundred of rubber

** cyclohexylbenzothiazole-2-sulphenamide

Cyclic crack growth

Tensile strips approximately 120 mm length, 25 mm width and of 0.5 mm thickness were cut from vulcanised sheets both unaged and aged at 100°C. The strain energy density, W at a specific strain was obtained from the area under a stress versus strain curve up to that strain. After stress-strain measurements for the strips had been obtained, the test piece was then set up to the required maximum extension and a crack about 0.5 mm length was made in the centre of one edge with a razor blade. Samples then were cycled using TARRC's in-house fatigue machine from a fully relaxed condition to a maximum constant extension.

During the test, the crack length c, was

measured with a travelling microscope fitted with an eyepiece scale, the strip being slightly strained during the crack length measurement to facilitate observation. Readings were taken at intervals of n cycles corresponding to a 10-30% increase in crack length. The rate of growth per cycle dc/dn was determined from the difference in crack length divided by the number of cycles between two readings. The tearing energy for this period was calculated from the average of the initial and final crack lengths during this increment of crack growth and the strain energy density at the maximum strain of the cycle using equation

$$T = 2K(l)Wc \qquad \text{(equation 2)}$$

The test is stopped when the cut reaches 20% of the test pieces width, as theory assumes this ratio to be small. The crack growth per cycle, dc/dn, was then plotted as a function of tearing energy on a double logarithm plot.

RESULTS AND DISCUSSION

Catastrophic tearing energy, Tc

The tear behaviour of elastomers is such that at a certain severity of the deformation a tear or crack will suddenly increase in length by a readily visible amount perhaps growing right across the test piece. The magnitude of the load or deformation required to produce this catastrophic tearing depends upon the nature of the material and also on the type of test piece used. However, if the results are expressed in terms of tearing energy then the onset of the catastrophic tearing can be defined by the critical tearing energy value Tc, which is independent of the form of test piece used [Rivlin and Thomas, 1953].

The tearing energy of an unfilled elastomer depends upon the nature of the molecular backbone, the molar mass of the polymer and the concentration and the nature of the crosslinks. Different curing systems can produce widely different strengths for the same polymer backbone, even when compared at a similar degree of crosslinking [Gee, 1947]. Figure 1 shows how the catastrophic tearing energy Tc as a function of ageing time for conventionally cured NR and efficiently cured NR aged aerobically and anaerobically at 100°C. The Tc for the efficiently cured vulcanisates aged under anaerobic conditions for 3 days was reduced by about 35% when compared to the unaged sample. Increasing the ageing period from 3 to 6 days had little further effect. For aerobically aged vulcanisate, Tc was reduced by 34% after ageing for 3 days and reduced by 48% after 6 days.

For a conventionally cured vulcanisate aged anerobically at 100°C, Tc fell by 15% after a 3 days period. It was further reduced by 15% after the next 3 days. For aerobic ageing, Tc for conventionally cured vulcanisates fell by 65% after ageing 3 days and further reduced by another 24% after the next 3 days. The larger reduction in Tc for the conventionally cured system when compared with efficiently cured system probably relates to a larger amounts of new crosslinks, scission of the main chain and crosslinks and chemical modification to the main chain, all of which are believed to occur in conventionally cured NR during oxidative ageing [Cunneen, 1968]. Although efficiently cured NR showed a better heat ageing resistance, the initial strength was inferior when compared to the conventionally cured NR [Baker, 1988].

Figure 2 shows the percentage retention of Tc after anaerobic and aerobic ageing at 100°C for conventionally cured NR and efficiently cured NR. Results show that both systems retain about 75% of Tc after ageing

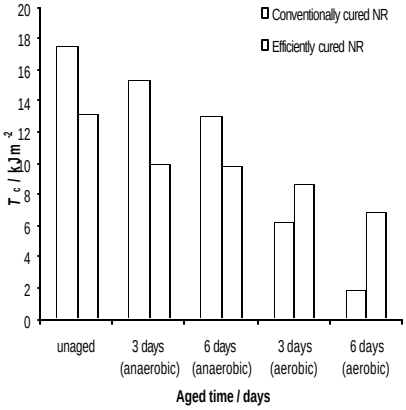

Figure 1: Tc as function of ageing time for NR vulcanisates aged aerobically and anaerobically at 100°C.

anaerobically for 6 days. During the early stages of ageing, a conventionally cured NR retained slightly more Tc when compared to an efficiently cured NR. For aerobic ageing, efficiently cured NR retained about 50% of Tc after ageing while conventionally cured NR test pieces lost almost 90% of their original Tc. For the conventional cured NR, a lower retention of Tc was observed. Ageing at lower temperatures gave a slightly higher retention of Tc but still with drastic loss of their original strength. This system contains predominantly poly-sulphide crosslinks which are thermally unstable and undergo a number of competing reactions (crosslink shortening, crosslink destruction and main chain modification) [Morrison, 1984; Chapman and Porter, 1988] resulting in lower strength after ageing. A smooth tearing similar to that for a non-crystallising rubber was observed for conventional cured NR after ageing 6 days at 100°C. This suggests that strain-induced crystallisation is inhibited after ageing for extended periods at 100°C.

Cyclic crack growth

The tearing energy approach has proved to be successful in treating the fracture of elastomers [Gent, Lindley and Thomas, 1964]. However, the tearing tests presented before only estimate the

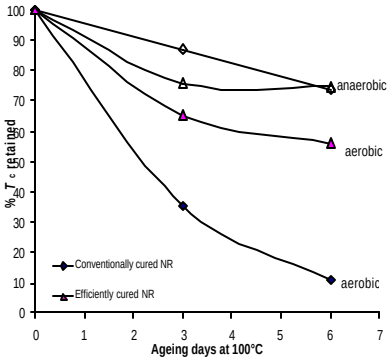

Figure 2: Percentage retention of Tc as function of ageing time for NR vulcanisates aged aerobically and anaerobically at 100°C.

strength of elastomer under a single loading cycle producing rapid crack growth. For the majority of elastomeric components, failure is not usually due to large static load resulting in catastrophic failure but to the smaller cyclic fatigue loads. Cyclic crack growth behaviour is the most appropriate approach to predict the service life of components. Relationship between the incremental crack growth rate per cycle dc/dn and tearing energy T have been referred to as the "crack growth characteristics", since it represents the basic tearing property of the vulcanisates [Lake and Lindley, 1964].

The effect of accelerated ageing on the cyclic crack growth has been investigated for both aerobic and anaerobic ageing for efficiently cured NR and conventionally cured NR. Samples were aged for 3 and 6 days at 100°C. The crack growth rate dc/dn as function of tearing energy, T is given in figures 3 and 4. In general, results for different periods of ageing showed that for a given tearing energy, the rate of crack growth per cycle was increased after aerobic ageing. During anaerobic ageing, the efficiently cured NR showed little change in properties with ageing whilst the conventionally cured NR showed an initial increase in the crack growth rate at a given tearing energy during ageing.

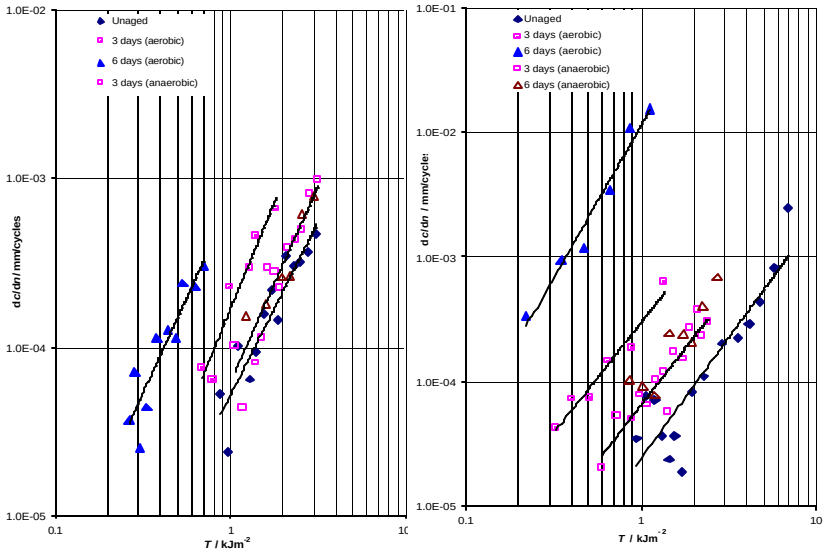

Figure 3 and figure 4: Crack growth rate (dc/dn) as function of tearing energy (T) for efficiently cured NR and conventionally cured NR aged aerobically and anaerobically at 100°C.

With the efficiently cured material, the presence of oxygen during ageing clearly plays a significant role in the ageing process. The tearing energy required to cause a crack to grow at 1.0 x10^{-4} mm per cycle was decreased by a factor of 1.6 during ageing for 3 days and by a factor 3.2 during ageing for 6 days. This is in marked contrast to the anaerobic ageing which appears to have virtually no effect on cyclic crack growth behaviour.

Figure 4 shows the tearing energy, for the conventional cured NR vulcanisate, at a crack growth rate of 1.0 x10-4 mm per cycle decreased by a factor 3.8 after ageing 3 days and by a factor about 10 after ageing for 6 days aerobically when compared with the unaged sample. For conventionally cured NR, anaerobic ageing did initially produce an increase in the crack growth rate. However, it appears that increasing the ageing period from 3 to 6 days has little further effect on the crack growth properties unlike the sample aged under aerobic conditions. The effects of ageing on the crack growth properties of the efficiently cured compound were not as pronounced as that for the conventionally cured NR. This may be due to the inhibition of strain crystallisation in the conventionally cured compound as a result of ageing, caused by chain modification [Bristow and Tiller, 1970].

The effects are more significant for samples aged 6 days at 100°C.This is possibly due to the fact that conventionally cured systems contain predominantly poly-sulphide crosslinks which are thermally unstable and undergo a number of competing reactions (crosslinks shortening, crosslinks destruction, main chain modification) [Morrison, 1984; Chapman and Porter, 1988] and the inhibited of strain induced crystallisation.

SUMMARY AND CONCLUSIONS

Measuring the strength and cyclic crack growth behaviour of the test pieces, before and after ageing gives a good measured of the amount of ageing that has occurred. Conventionally cured NR shows higher initial strength compared to efficiently cured NR. However, after aerobic ageing at up to 6 days at 100°C, conventionally cured NR lost almost 90% of it strength. The high strength of conventionally cured NR is believed to depend critically upon its ability to crystallise on stretching. The decrease in catastrophic tearing energy Tc for conventionally cured NR was about 3 times greater after aerobic ageing for 6 days at 100°C when compared to that of efficiently cured NR aged for the same conditions. The effect of anaerobic ageing was not as pronounced as that of aerobic ageing.

For both conventionally cured NR and efficiently cured NR, the tearing energy required to achieve a given crack growth rate decreased with longer time of ageing when aged aerobically. Results show that samples aged for 6 days at 100°C for the conventionally cured NR exhibited higher crack growth rate when compared to the efficiently cured NR. For samples aged anaerobically, a different crack growth behaviour was observed for compounds with different curing systems, with efficiently cured NR showing little or no effect after anaerobic ageing.

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Preparation of Alumina Fibre from Sol Gel Isopropoxide System and its Application in Aluminium Matrix Composite

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Abstract
Alumina fibre is one of the ceramic fibres, which offer good properties especially in high temperature applications. In this study, alumina fibre using aluminum isopropoxide and 0.5M aluminum nitrate nonahydrate aquoes sol as starting material was succesfully produce through a new method, modified from a new method for producing mullite fibre. The formation of fibre was made using in-house built spinnerets. The spinned gel fibre were dried and then calcined at different temperatures ranging from 500ºC to 1200ºC. The gel and calcined fibre were characterized using X-Ray Diffraction (XRD) and Scanning Electron Microscopy (SEM). XRD shows that increasing in calcination temperature changes the phases formed, i.e from -alumina to the stable -alumina. SEM showed flexible and almost uniform in diameter of the fibres. Alumina fibres produced were then applied in aluminium matrix composite. It also shows that fibres produced have the tendency to increase the mechanical property of MMC and gave similar properties compare to MMC using commercial fibres.

Introduction.
Alumina fibres have good temperature resistance due to its physical and chemical properties[1,2,3]. Of more than 15 distinct crystallographic phases of alumina, the and forms find wide applications due to their distinct properties. The high specific surface are of -alumina are enable its use as a catalyst support whereas the polycrystalline -phase finds applications as a structural ceramics[4]. Among of the ways to produce alumina fibre, sol-gel method has been used for the synthesis of ceramic fibres precursor since refractory oxide have extremely high melting points as well as the high viscosity of melts. Some advantages of the sol-gel method over the conventional melting method are better homogeneity and purity from raw material, lower preparation temperature which save energy cost and the ability to form unique composition[5]. Ceramic fibres have increasing applications for the reinforcement of metals and ceramics. Light-metal composites reinforced with ceramic particles and short fibres are increasingly being introduced in structural applications because they can offer advantageous properties at competitive price. It is generally agreed that alumina fibres is an ideal reinforcing material for aluminium and its alloy, since the metal and fibres are physically and chemically compatible[6]. This paper presents an inexpensive sol gel route to produced quality alumina fibres using appropriate ratio of aluminium isopropoxide (ALP) to aluminium nitrate nonahydrate (ALN) and its determined the properties of the aluminum matrix composite reinforced synthesized alumina fibres compared to the composite system reinforced commercial alumina fibres.

Materials and Method
Aluminum Isopropoxide, ALP (Al (OPr_3), Merck 98% and aluminium nitrate nanohydrate, ALN (Al $(NO_3)_3$. $9H_2O$, R&M Chemical, 98%) were used as a starting materials at molar ratio, aluminium isopropoxide (ALP): 0.5M aluminium nitrate nonahydrate (ALN) =3. Synthesized sol was then evaporate using rotating evaporator to raise up the viscosity then spin using in-house spinneret drum and the spun fibre were calcined one hour at temperature ranging fro 500 °C to 1200 °C in air with 5 °C/min heating rate. The oxide fibres characterized using XRD and SEM to observe the phase transformation and the properties of the fibres. Fibres (namely Alkoxide) were then applied in aluminium matrix composite to observe the tendency and their effect compare to MMC with commercial alumina fibre, Almax (Mitsui Mining Co. Ltd, Japan) and Saffil (Saffil, USA). The Al and Al_2O3 fibre at weight % ratio 90:10, were mixed via wet blending technique for 10 hours,filtered and dried, then pressed at 210 MPa. Samples were sintered at 600°C for 7 hours in normal atmosphere with 10°C/min heating rate. Characterizations done on MMC were hardness (Vickers) and three bending test to observe the yield strength of the composite

Result and Discussions
XRD results were summerized in Table 1, its shown the tranformation of the the alpha phase was clearly observed at 1200°C. According to Hyuk_Joon et al[7], the complete of the most stable phase, alpha ( ) occurs at about 1200°C.This characterization (XRD) were done to make sure that the alpha phase were dominantly occured in fibres produced which is important for application in composite, because, according to Wilson and Visser[8], pollycrystalline alumina fibre with higher phase content which is free from glassy phase were chemically stable. Thus, give good stablization in corrosion atmosphere, low reactivity with metal matrix such as aluminum and less interaction to varieties of ceramic matrix.

SEM analysis (Figure 1) shows that the fibre calcined have the flexible property and uniform diameter. The flexibility was an important characteristic needed in ceramic fibre reinforcement, so that preforms can be made by weaving or other related technologies. SEM analysis also shows that the fibre have a uniform diameter at range of 10 - 20 *u*m. According to Bunsell and Berger[9], fibres with diameters in the range of 10 - 20 um are candidates as reinforcement. A lower limit in fibres diameter is around 1 m as at this diameter the fibre become a health hazard, if inhaled, as they block the alveolar structure of the lungs.

Table 1: Transformation phase of alumina fibre

Calcinations temperature (°C)	phase
500	am
700	$\gamma + \delta$
900	$\delta + \theta$
1100	α
1200	α

Note : am= amorphous,
= gamma alumina, ICDD: 10-425
= delta alumina, ICDD:16-394
= theta alumina, ICDD:11-517
= alpha alumina, ICDD: 10-173

Analysis on the composite fabricated shows that the yield strength (Figure 2) of the composite reinforced Alkoxide has highest value but lower then the yield strength for pure aluminium (84.93 MPa).
For the hardness analysis (Figure 3), the results shows that the composite

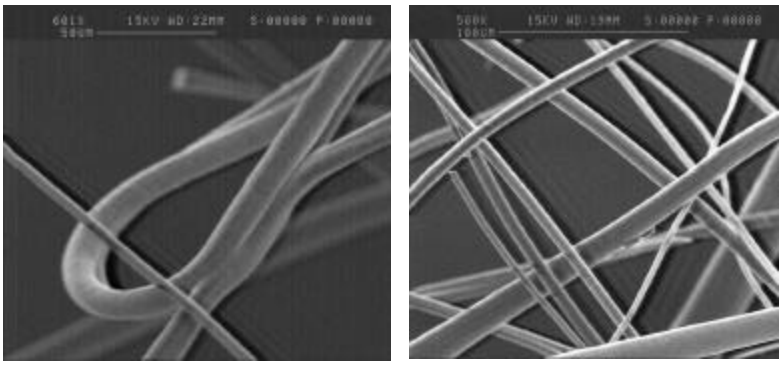

Figure 1: SEM shows the flexible and almost uniform diameter of the fibre calcined at 1200 ^{O}C.

reinforced Akoxide gave the lowest value compared to the composite reinforced commercial fibre therefore the value is not too much different. However the value still higher than the hardness for pure aluminium (40.1 HVN). Regarding to Pangounis and Lindroos[10], generally, the addition of ceramic reinforcement can decrease the strength of the composite. It was supported by Martinez and co-workers[11] which reported, addition of the alumina fibre resulted in a poor contact between metal particles, reducing the possibility that diffusion bonding occurs between them and so the material behaves in a very brittle manner because particle/alumina decohesion occurs.

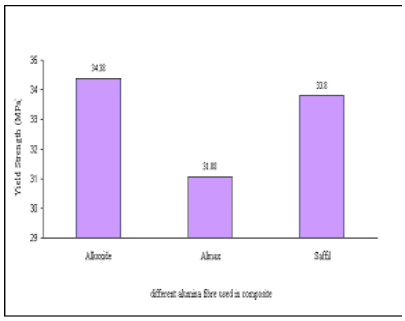

Figure 2: Yield strength value obtained for the composite reinforced different fibre

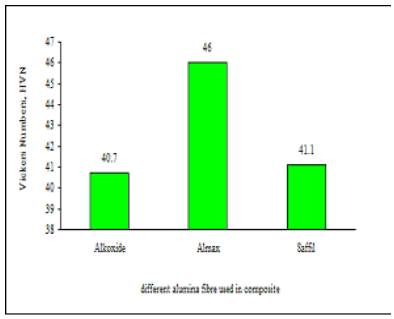

Figure 3: Hardness obtained for the composite reinforced different fibre

Conclusions

Alumina fibres produced from isopropoxide system through sol-gel method were produced using ALP-0.5M ALN molar ratio=3. The fibres have the properties which is suitable for the composite applications. The application of the fibre in aluminum matrix composite gave better mechanical properties compared to composite reinforced commercial alumina fibres where the yield strength was increase and the hardness is not too much different. These, shows that alumina fibres synthesized were having the tendency to apply in MMC and increase the mechanical properties.

Acknowledgement

The authors would like to express their thanks to Malaysian Ministry of Science, Technology & Innovation for funding this project under Intensification of Research in Priority Area (IRPA) grant 03-02-05-8003.

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She was driven to a beautiful garden

She was driven to a beautiful garden
Had a stroll side by side
with flowers and greeneries
the wistful voice beside
the world was felt wonderful
then she thought,
..."this is a new world"... "this is a new world"...

Reached the far end
She turned left and right
Then all around
She was barely alone

Her thought began unstable
Where am I...
...No fixity of purpose
...No anchor of righteousness

Sat painfully under the old tree
Midnight came
As she rose with miserable wretch
Her boots tramped slowly under the moonlight

"There it grew the old worn love"
"And there too, an invulnerable soul was left"

She walked...
Until the new day begun.

Koe-Shizuka

SEMBILAN PENSYARAH PPKBSM TERIMA ANUGERAH SANGGAR SANJUNG

13 Januari 2006 - Seramai 9 orang pensyarah Pusat Pengajian Kejuruteraan Bahan & Sumber Mineral (PPKBSM) telah menerima Anugerah Sanggar Sanjung 2005 yang telah diadakan di Hotel Equatorial, Pulau Pinang.

"Anugerah Sanggar Sanjung 2005" merupakan satu majlis pengiktirafan USM untuk staf yang telah mengharumkan nama USM dengan mendapatkan kajayaan yang cemerlang dalam aktiviti-aktiviti penyelidikan,akademik, kualiti dan kreativiti sepanjang tahun 2005.

Antara penerima anugerah Sanggar Sanjung 2005 ialah Profesor Hanafi Ismail, Profesor Radzali Othman, Profesor Zainal Arifin Ahmad, Prof. Madya Dr. Luay Bakir Hussain, Prof. Madya Dr. Azizan Aziz dan En. Ahmad Badri Ismail bagi kategori Produk Penyelidikan.Manakala Dr. Zainovia Lockman, Dr. Ahmad Azmin Mohamad dan Dr. Cheong Kuan Yew pula penerima anugerah bagi kategori penerbitan.

Antara tetamu kehormat Malam Sanggar Sanjung ialah Seri Paduka Baginda Yang Dipertuan Agong, Tuanku Syed Sirajuddin Ibni Al-Marhum Tuanku Syed Putra Jamalullail dan Seri Paduka Baginda Permaisuri Agong, Tuanku Fauziah Binti Al-Marhum Tengku Abdul Rashid.

Pensyarah Pusat Pengajian Kejuruteraan Bahan & Sumber Mineral (PPKBSM) bersama pasukan penyelidiknya bergambar kenangan di malam Anugerah Sanggar Sanjung 2005 yang telah diadakan di Hotel Equatorial, Pulau Pinang.

New Staff 2006

Lecturer

Dr. Srimala Sreekantan

Dr. Zulkifli Ahmad

Research Grants Recieved

No.	Title	Sponsor	Researcher	Amount (RM)
1.	Preparation and characterization of high-K dielectric material of CCTO	Nippon Sheet Glass	Dr. Sabar Derita Hutagalung	26110.00
2.	Production of raw material for ceramic and glass industries through processing of pegmatite ore.	Short term grant USM	Dr. Hashim Hussin	16315.00
3.	Development of SiO2 thin film on single crystal sic by anodic oxidation	Short term grant USM	Dr. Cheong Kuan Yew	17318.00
4.	Hydro-electrometallurgical extraction of zinc from zinc bearing industrial waste	Short term grant USM	Dr. Norlia Baharun	18338.32
5.	Polymer composite for thermal interface material.	Intel	Assoc. Prof. Azizan Aziz	60000.00
6.	The study of the tin based lead free solder alloy composition and its effect on surface finish.	Intel	Assoc. Prof. Luay Bakir Hussin	60000.00
7.	Development of low temperature tenery solders system ranging from 60^{0}C to 80^{0}C.	Intel	Assoc. Prof. Luay Bakir Hussin Mr. Ahmad Badri Ismail	49000.00
8.	The influence of dopant on the properties of SnAgCu lead free solder.	Intel	Mr. Ahmad Badri Ismail Assoc. Prof. Dr. Luay Bakir Hussain	39500.00
9.	Assessment of various oxide and mineral filler for epoxy substrate in order to improve rigidity and reduce CTE mismatch.	Intel	Dr. Hazizan b. Md Akil	33000.00
10.	Conductive polymer composite for electronic packaging.	Intel	Dr. Mariatti Jaafar @ Mustapha	37000.00
11.	Preparation and study of low CTE substrate materials in electronic packaging.	Intel	Dr. Mariatti Jaafar @ Mustapha	30000.00
12	Barmee VSI Crushing Technology	Metso Minerals New Zealand	Assoc Prof Khairun Azizi Mohd Azizli Dr. Hashim Hussin Dr. Syed Fuad Saiyid Hashim Mr. Samayamutthirian Palaniandy	28328.18

JERA-Ash: Versatile Raw Material For Glasses, Glazes And Polymers (Won Bronze Medal at MTE 2006)

Researchers:
Prof. Radzali Othman
Dr. Hasmaliza Mohamad
Habsah Haliman
Hamisah Ismail
Ervina Efzan Mohd Noor
Faridah Mohd Yusuf
Mahizan Hijaz Mohammad

Introduction.
Paddy stalks posed numerous environmental problems all over the world after they are harvested. The problems include safety hazards when open burning of this waste material is carried out. Producing JERA-Ash from paddy stalks is akin to "turning waste into gold".

What is new about the material?
The novelty of JERA-Ash lies in the fact that this product which is resourced from agricultural waste materials, especially jerami, can be produced in various grade that can be tailored to specific end-uses in the glass, ceramics and polymer industries. The various grades are engineered through a novel proprietrary process of pre-treatment followed by either a soft or hard firing process.

What is so special about the JERA-Ash?
Much can be said about rice husks but there has never similar research work on jerami (also from the paddy plants). The ash that is produced has numerous attractive properties such as lightness, porosity and diversity in morphological forms. These attributes render the ash suitable for the intended applications mind.

What are the potential applications of JERA-Ash?
It can be used as the major component in the production of specialty glasses.
It can be used in glaze formulations to coat ceramic materials and the variously treated products can affect exotic colours and shades.
It can be incorporated as fillers in polymers and rubbers which are lighter but still retaining its stiffness as compared to conventional fillers.

What are economic and scientific plus factors?
Cheap and abundant waste raw materials easily resourced in Malaysia and within ASEAN.
Tangible products engineered from scientific principles in glass, glaze, polymer and chemicals technology.

From Various Rubber Wastes into MultiFunctional Adhesive (MFA): A Novel Recycling Process (Won Silver Medal at MTE 2006)

Researchers:
Prof. Hanafi Ismail
Dr Azura Ab. Rashid
Supri

Introduction.
One of the various problems which mankind faces as it enters into the 21st century is the problem of waste disposal management. Since polymeric materials do not decompose easily, disposal of waste polymers is a serious environmental problem. Scrap rubbers are made up of rubber that does not meet processing and product specifications, leftover rubber from manufacturing activities and also old and defective rubber products such as gloves, catheters, tubes, old tyres etc. Presently, the amount of discarded tyres reaches 10 million/year worldwide. In Malaysia, the output of rubber gloves in 2003 was 13.05 billion pairs, catheters 84.75 million units and inner tubes 13.05 million units. With the development of rubber industry, a lot of waste rubber is produced not only in Malaysia but all over the world every year.

MAIN PURPOSE OF THE INVENTION
1. To reduce the amount of various rubber wastes such as tyres, gloves, catheters, tubes, etc by recycle them into MultiFunctional Adhesive.
2. Help Malaysian government and other countries to solve the environmental problem of disposal various rubber wastes through the recycling of various rubber wastes into valuable products.
3. To recycle rubber wastes using a novel process and low cost.

THE MAJOR ADVANTAGES OF THE INVENTION
1. Using the conventional rubber processing two roll mill at room temperature, novel process and low cost, various rubber wastes can be recycled and converted into MultiFunctional Adhesive with the help of a new recycling chemical, DeCrossCHEM.
2. MultiFunctional Adhesive (MFA) is a strong contact adhesive specially formulated for bonding wood, PVC pipe, laminates, leather, cork, foam, polyurethane (PU), rubber, etc.
3. advantages of MultiFunctional Adhesive (MFA) are:-
-easy to apply, Strong bonding
- fast drying, Multipurpose
-high water resistance
- Multicolour, cheap
4. MultiFunctional Adhesive (MFA) can also be used to trap rat, fly, bird,etc.

CERAMIC-METAL CUTTING TOOL PRODUCED VIA FRICTION WELDING

(Won Gold Award at ITEX 2006)

Researchers:
Prof. Zainal Arifin Ahmad
Assoc. Prof. Luay Bakir Hussain
Mohamad Zaky Noh

Currently most commercially cutting tips are made from tungsten carbide, which is produced via expensive process i.e. powder metallurgy route. In order to apply these cutting tips for cutting or milling process, it must be screwed/brazed to cutter holder (made from metal). Therefore, when the screw is not properly tightened, it will produce vibration during cutting process and the cutting tips will finally break. Or, if screwing is too tight, the cutting tips also will easily break.

Ceramic has excellent hardness, possess high melting point and good wear resistance and it is the best candidate to be made as the cutting tips. Meanwhile, metals are tough and ductile materials. In order to realize the full potential of cutting tips, the combinations of both materials are needed.

Therefore, our new invention is a specially designed alumina ceramic cutting tips bonded to tough stainless steel holder via friction welding technique.

Alumina cutting tip was produced through slip casting. Stainless steel rod was supplied by local supplier. Alumina-stainless steel was joint via friction welding. Friction time needed for each joining is 10 seconds.

This product is unique because it combines an excellent hardness, brittle, high melting point and good wear resistance material (derives from alumina ceramic) with a tough, ductile, lower melting point, and conductive material (from stainless steel).

The joining of materials with very large differences in mechanical and chemical properties was achieved through friction welding technique. This product is suitable as an alternative product for cutting tool. The various advantages of this product are:

-This cutting tool could avoid cutting tip vibration during cutting process because of the direct joining between alumina and steel.

-Service life of the cutting tool is longer due to this characteristic.

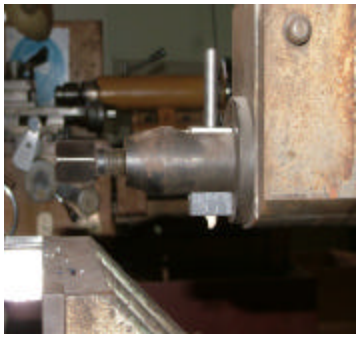
-This product may withstand bending strength at the joining to up to 233 MPa.

-Mass production is possible due to the friction welding process and can be done within a few seconds.

-Reduce the production cost when engages in mass production process.

-Reduce the power consumption because the process takes shorter time to accomplish.

-Waste or scrap materials could be avoided because the joining process only involved metal and ceramic surfaces.

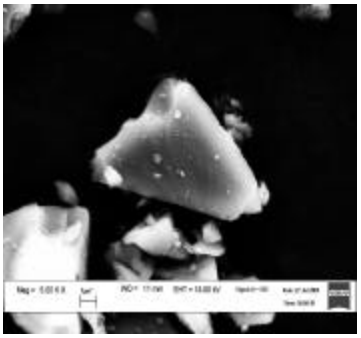


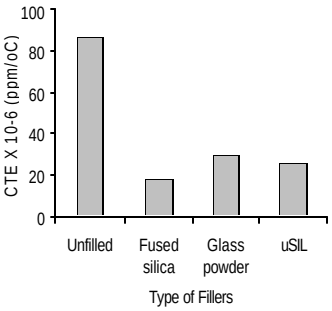
uSIL

Researchers:
Assoc.Prof Khairun Azizi Mohd Azizli,
Samayamutthirian Palaniandy,
Dr. Mariatti Jaafar @ Musthapa,
Dr. Hashim Hussin and Dr. Syed Fuad Saiyid Hashim

(Won Bronze Medal at MTE 2006)

The mismatch of coefficient of thermal expansion (CTE) of IC, solder and substrate is a common problem in the electronic industries and it has been solve by using encapsulate, epoxy. The high CTE value of epoxy can be decreased by incorporating inorganic filler such as silica. Currently exorbitant fused silica (FS) and precipitated silica (PS) has been used as filler in the epoxy. Alternatively glass powder can be used but due to the massive agglomeration and poor particle shape and texture will result in poor performance of epoxy. SIL which is a locally produced silica filler is an ideal solution to substitute the exorbitant FS and PS. SIL is a series of ultra fine silica product which has been reengineered in terms of physical properties to cater the stringent specification of industrial filler needs. SIL series consists of SIL4, SIL6 and SIL10 which are categorized based on its equivalent diameter and particle shape which has been well quantified. SIL is produced through a well controlled fine grinding operation in a fluidized bed jet mill. The precise control of the fluidized bed jet mill can solved both problems by producing narrow size distribution with very minimal agglomeration and additionally the enhancement of particle shape. SIL series are strong particles as the weak planes had been removed and it has smooth surfaces with folds. Rounded edges after trimming process reduces the stress point in the particle and eventually reduced the probability of particle failure. SIL is a universal mineral filler which can be used in various industry according to its physical characteristics. SIL4 which has been tested in the epoxy, resulted in excellent performance in terms of thermal and mechanical characteristics. It has a comparable CTE values to FS and thermal stability. SIL4 also exhibits high flexural modulus and flexural strength at higher filler loading with minimal agglomeration. The production cost of SIL is around RM 1.00/kg which is much cheaper than imported fine silica particle. The huge local silica resources and electronics industries in Malaysia will enhance the production and consumption of SIL.





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