UNIVERSITI SAINS MALAYSIA

First Semester Examination
Academic Session of 2007/2008

October/November 2007

EBP 303 – Plastic Materials
[Bahan Plastik]

Duration: 3 hours
[Masa: 3 jam]

Please ensure that this paper consists of NINE printed pages before you proceed with the examination.
[Sila pastikan bahawa kertas peperiksaan ini mengandungi SEMBILAN muka surat yang bercetak sebelum anda memulakan peperiksaan.]

This paper contains THREE questions from PART A and FOUR questions from PART B.
[Kertas soalan ini mengandungi TIGA soalan dari BAHAGIAN A dan EMPAT soalan dari BAHAGIAN B.]

Instruction: Answer **FIVE** (5) questions. Answer **ALL** questions from PART A and any **TWO** (2) questions from PART B. If a candidate answers more than five questions, only the first five questions answered will be examined and awarded marks.
[Arahan: *Jawab **LIMA** (5) soalan. Jawab **SEMUA** soalan dari BAHAGIAN A dan mana-mana **DUA** (2) soalan dari BAHAGIAN B. Jika calon menjawab lebih daripada lima soalan hanya lima soalan pertama mengikut susunan dalam skrip jawapan akan diberi markah.]*

Answers to any question must start on a new page.
[Mulakan jawapan anda untuk setiap soalan pada muka surat yang baru.]

You may answer a question either in Bahasa Malaysia or in English.
[Anda dibenarkan menjawab soalan sama ada dalam Bahasa Malaysia atau Bahasa Inggeris.]

PART A.
BAHAGIAN A.

1. [a] High density polyethylene (HDPE) and low density polyethylene (LDPE) are both made from the same monomer, ethylene. However, HDPE is tough and rigid, whereas LDPE is soft and flexible.

Kedua-dua polietilena berketumpatan tinggi (HDPE) dan polietilena berketumpatan rendah (LDPE) dihasilkan daripada jenis monomer yang sama iaitu, etilena. Namun begitu, HDPE bersifat liat dan tegar manakala LDPE bersifat lembut dan mudah lentur.

(i) What difference in structure accounts for the difference in the properties of HDPE and LDPE?

Apakah perbezaan dari segi struktur yang mempengaruhi perbezaan sifat di antara HDPE dan LDPE?

(35 marks/*markah*)

(ii) Which type polyethylene is used in detergent bottles?

Jenis polietilena yang manakah digunakan sebagai botol bahan cuci?

(5 marks/*markah*)

[b] Compare and contrast polycarbonate and polystyrene in the following properties (tensile strength, impact toughness, melting point, clarity and solvent resistance) and explain your answer on a molecular basis.

Bandingkan dan bezakan polikarbonat dan polistirena bagi sifat-sifat berikut (kekuatan tegangan, keliatan hentaman, takat lebur, kejelasan, dan kerintangan pelarut) dan jelaskan jawapan anda berasaskan molekul (molecular basis).

(60 marks/*markah*)

...3/-

2. [a] Describe clearly on the classification of various types of additives used for plastic materials

Terangkan dengan jelas bagaimanakah pelbagai jenis aditif yang digunakan untuk bahan plastik di kelaskan.

(30 marks/*markah*)

[b] Describe how blowing agent functioned in the production of cellular plastics.

Terangkan bagaimanakah agen peniupan berperanan dalam menghasilkan plastik selular.

(20 marks/*markah*)

[c] What are the advantages of natural fillers such as wood flour and starch as compared to synthetic fillers?

Apakah kelebihan pengisi semulajadi seperti serbuk kayu dan juga kanji berbanding dengan pengisi sintetik.

(25 marks/*markah*)

[d] What are the main aspects normally used in characterizing fillers for plastic materials?

Apakah aspek utama yang biasa digunakan untuk mencirikan pengisi bagi bahan plastik?

(25 marks/*markah*)

3. [a] Describe plastic compounding process. Why compounding is important in plastic industry?

Terangkan proses penyebatian plastik. Mengapa penyebatian penting dalam industri plastik?

(30 marks/*markah*)

[b] What is masterbatch? Discuss the advantages of using masterbatch compared to normal compounding technique.

Apakah baya induk? Bincangkan kelebihan menggunakan baya induk berbanding teknik penyebatian biasa.

(30 marks/*markah*)

[c] Describe three (3) general compounding problems encountered during processing. Give also causes of failure in compounding process.

Terangkan tiga (3) masalah umum penyebatianyang dihadapi semasa pemprosesan. Berikan sebab-sebab kegagalan dalam proses penyebatian.

(40 marks/*markah*)

PART B.
BAHAGIAN B.

4. [a] The differences in properties among the various type of nylons largely depend on the number of carbons in the methylene segments (CH_2 units) between the amide groups. Compare and contrast the following properties of nylon (6/6) and nylon (6/12): water absorption, tensile strength, stiffness, and flexibility. Suggest an application for these nylons.

Perbezaan sifat di antara jenis nilon yang berbeza bergantung kepada bilangan atom karbon pada segmen metilena (CH_2 unit) di antara kumpulan amida. Banding dan bezakan sifat-sifat berikut bagi nilon (6/6) dan nilon (6/12): keserapan air, kekuatan tegangan, ketegaran, dan kelenturan. Cadangkan satu penggunaan bagi nilon-nilon ini.

(30 marks/*markah*)

[b] How do we process expandable polystyrene (EPS) into a product?

Bagaimanakah kita memproses 'expandable' polistirena kepada produk?

(30 marks/*markah*)

[c] Which plastic film is suitable for packaging of bakery items, LDPE or LLDPE? Discuss your choice.

Filem plastik yang manakah sesuai digunakan bagi pembungkusan barangan berasaskan roti, LDPE atau LLDPE? Bincang pilihan plastik anda.

(40 marks/*markah*)

5. [a] The flame retardancy of polymer and its composites can be characterized by vertical burn test (UL94-V). Describe clearly the classification of UL94-V.

Sifat rencat nyalaan bagi polimer dan komposit boleh dicirikan menggunakan ujian pembakaran vertikal (UL94-V). Terangkan dengan jelas pengkelasan UL94-V.

(30 marks/*markah*)

[b] Describe the flame retardant mechanism associated with ammonium polyphosphate.

Terangkan mekanisme rencat nyalaan yang di kaitkan dengan ammonium poli fosfat.

(30 marks/*markah*)

[c] Write short notes on TWO of the following topics:

(i) Stabilising and anti-oxidant agents.

(ii) Plasticizing agents.

(iii) Anti-static agents.

Tulis nota ringkas tentang DUA daripada topik berikut:

(i) Agen penstabil dan anti-pengoksidaan.

(ii) Agen pemplastik.

(iii) Agen anti-statik.

(40 marks/*markah*)

6. [a] Describe miscibility and compatibility and their importance in plastics compounding.

Terangkan kebolehcampuran dan keserasian dan kepentingan mereka dalam pemprosesan plastik.

(40 marks/*markah*)

[b] Explain three (3) methods to determine miscibility/immiscibility in polymer blend.

Jelaskan tiga (3) kaedah untuk menentukan kebolehcampuran / ketidakbolehcampuran dalam campuran polimer.

(30 marks/*markah*)

[c] Give simple additives rule and explain all the terms used in term of properties and interaction.

Berikan hukum campuran mudah dan jelaskan terma yang digunakan dengan merujuk pada sifat dan interaksi.

(30 marks/*markah*)

7. [a] Briefly describe the following terms:

(i) Heat history.

(ii) Sintering.

(iii) Soft-in-extension.

Secara ringkas jelaskan ungkapan-ungkapan berikut:

(i) "*Heat history*".

(ii) "*Sintering*".

(iii) "*Soft-in-extension*".

(30 marks/*markah*)

[b] Write short notes on ONE of the following topics:

(i) Liquid crystalline polymers (LCP).

(ii) Ionic polymers.

Tuliskan nota ringkas tentang SATU daripada topik berikut:

(i) Polimer hablur cecair (LCP).

(ii) Polimer ionik.

(40 marks/*markah*)

[c] Discuss results shown in Figure 1.

Bincangkan keputusan yang ditunjukkan dalam Rajah 1.

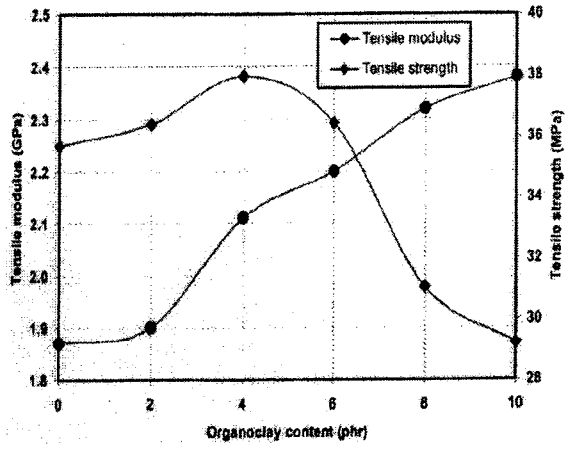

Figure 1: Tensile strength and modulus of organoclay reinforced plastic

Rajah 1: kekuatan tensil dan modulus plastik diperkuatkan tanahliat-organo.

(30 marks/*marks*)

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