Kulliyyah of Engineering

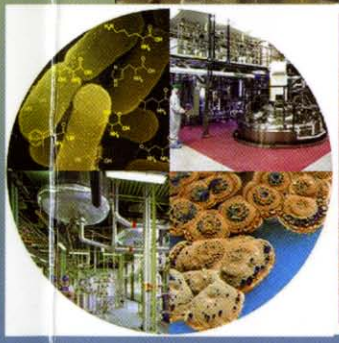
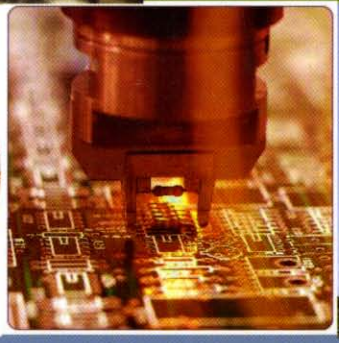
KERIE 2009

Research and Innovation Exhibition

Programme Book

January 21, 2009



KERIE

Quality Research for Human Services and Development

BTE - 03 New method for improving solubilization and uptake of lutein and carotenoids in human hepatocellular liver carcinoma (HepG2) cell culture

Dr. Irwandi Jaswir, Akihiko Nagao

Antioxidant activity of carotenoids may shift into prooxidant activity, depending on several factors, such as oxygen tension, carotenoid concentration, and interactions with other antioxidants. This study was conducted to prepare DMEM culture medium containing high concentrations of lutein and β-carotene for evaluation of the anti- and pro-oxidant activities and their dependency on concentrations of the carotenoids. We succesfully developed a new method to prepare DMEM medium containing higher concentration of lutein and beta-carotene. In the new method, lutein and β-carotene were solubilized in 5% THF. However, the concentration of THF was then reduced almost completely through evaporation. THF concentration checking was done using a headspace gas chromatography. Using this evaporation method, results showed that medium containing up to 90μM could be obtained, compared to a maximum of 15uM of lutein by using a conventional method, while THF was reduced to a non-toxic level as low as 0.01%. This finding allowed the use of high concentrations of the carotenoids for antioxidative activity study. Cellular uptake and antioxidative activity in HepG2 cells of the carotenoids were examined under a wide range of their concentrations.

BTE - 04 Production of Activated Carbon from Oil Palm Industrial Residue and Its Comparative Performance with the Commercial PAC

Emad S. M. Ameen, Prof. Dr. Suleyman A. Muyibi,
Assoc. Prof. Dr. Md Zahangir Alam,
Assoc. Prof. Dr. Nassereldin Ahmad Kabashi

Solid waste has become a major consequence of development and modernization, yet some of the greatest challenges to its managements in the developing countries. Malaysia is the largest oil palm producer in the world, one of the most abundant residues is empty fruit bunch (EFB), amounting to 12.4 million ton/y. Most of it is left unused and handled as solid waste in landfill. However, due to limited landfill sites as well as the additional treatment of the toxic liquid leached from the landfill, a research study is adopting to convert EFB into activated carbon.

Different powdered activated carbon (PAC) samples were produced from oil palm Empty fruit bunch (EFB) by varying the operating factors of temperatures, CO_2 gas flow rates and activation times using 2-level full factorial experimental design. The optimum production conditions were optimized through adsorption of phenol by PAC samples prepared. It was found to be at activation temperature of 900°C with CO_2 gas flow rate of 0.1 L/min and activation time of 15 minutes.

A comparative study involved adsorption on total phenol as well as physical characterizations was conducted between powdered activated carbon (PAC) prepared from EFB under optimum conditions and a commercial charcoal powdered activated carbon.

The results showed that the prepared PAC from EFB and the commercial PAC prepared from charcoal are almost comparable in the adsorption of phenol. High adsorption of phenol, 4.81 mg/g (96.2% phenol removal) by EFB-based PAC and 4.9 mg/g (98% phenol removal) by commercial PAC was recorded after 15 minutes contact time. There was slight increase in performance by 1.8% by the commercial PAC compared to EFB-based PAC. Physical characterization of BET surface area for PAC based-EFB and commercial PAC was determined. It was found to be 374.73m^2/g and 418.51m^2/g respectively. Scanning electron microscopy (SEM) technique was also employed to observe the surface physical morphology of the EFB-based PAC and commercial PAC. Well-developed pores were shown clearly on the surfaces of the precursor compared to that of the commercial PAC.

The performance of EFB-based PAC was found to be competitive to the commercial grade PAC. Therefore, the prepared activated carbon from EFB would be promising in two ways: it provides safe disposal of industrial waste while its potential adsorbent properties will contribute to solving part of the wastewater treatment problem especially for treatment of palm oil mill effluent (POME) which is known to have very high concentrations of phenolic compounds. This solution will also reduce the pressure on land for sanitary landfill as well as protect the natural Malaysian national asset of green cover of forests areas, since the commercial activated carbon is mainly from wood.