Development of graphne-mixed matrix membrane microextraction to the analysis of polycyclic aromatic hydrocarbons in environmental water samples

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ABSTRACT

A dispersive single layer graphene adsorbent was immobilized in the cellulose triacetate polymer matrix to form a graphene-mixed matrix membrane (G-MMM) for microextraction. The membranes were used to extract sixteen polycyclic aromatic hydrocarbons (PAHs) in environmental samples present in the environmental water samples as targeted model analytes. The extraction was carried out by dipping a piece of G-MMM in stirred 10 mL sample solution for analyte adsorption process. Entrapped analytes within the membrane were desorbed into 60 μL of methanol prior to high performance liquid chromatography (HPLC) analysis. The extraction performance was comprehensively optimized by investigating the effect of adsorbent loading amount, sample pH, salting-out effect, sample volume, extraction time, desorption solvent, and desorption time.

| Sample preparation | Mixed matrix membrane | Microextractio | Polycylic aromatic hudrocarbon |

Oxidation of 1-dodecene by Hierarchically-Porous TiO_2/*Averrhoa Bilimbi* Catalyst

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ABSTRACT

Oxidation reactions play an important role in organic syntheses. However, works on the oxidation of long chain alkenes, such as 1-dodecene, are limited and usually only focused on the use of modified Wacker process with the expensive palladium as the catalyst [1-3]. Besides that, in the oxidation of long chain terminal alkenes, it is usually difficult to attain good selectivity due to the isomerization of the internal alkenes, which will lead the oxidation process to several undesired isomerized products [4]. Therefore in this research, the main focus is on the use of a hierarchically-porous material that is naturally available, *Averrhoa bilimbi*, as the catalyst in the oxidation of long chain alkene with 1-dodecene as the model substrate. The hierarchically-porous catalyst was synthesized by impregnation of *Averrhoa bilimbi* with titanium(IV) tetrabutoxide as the titania precursor at room temperature. The resulting titania impregnated on *Averrhoa bilimbi* catalyst was first characterized by scanning electron microscopy (SEM), diffuse reflectance UV-Vis (DR UV-Vis) and Fourier transform infrared spectroscopy (FTIR) before being tested out in the oxidation reaction. Gas chromatography (GC) was used to analyze the products. The results showed a good conversion and selectivity towards the desired products. Hence, it is proven that the hierarchically-porous TiO_2/*Averrhoa bilimbi* catalyst is a promising catalyst for the oxidation of long chain alkenes.

| long chain alkenes oxidation | dodecene | impregnation | titania hierarchical porous catalyst |

Molybdena doped titania supported TUD-C as oxidative catalyst for styrene epoxidation

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ABSTRACT

Molybdena doped titania supported on TUD-C (Mo-TiO_2/TUD-C) oxidative catalyst has been synthesized and characterized. The self assembled zeolite inside the silica matrices with MFI framework has been confirmed using XRD analysis. The attainment of zeolite and MFI structures was supported by FTIR results. Crystallinity of the synthesized material decreased with increasing Si/Al ratio in the TUD-C due to the formation of amorphous silica. The crystallite size of the materials was 30 nm as evidenced by TEM analysis.
Among the samples prepared, Mo-TiO_2/TUD-C of Si/Ti = 10 and Si/Al = 10 showed the highest catalytic activity with styrene oxide yield and selectivity of 8.42 mmol and 97%, respectively at room temperature. The increase of both Si/Ti and Si/Al ratios in Mo-TiO_2/TUD-C led to poor catalytic performance due to less availability of catalytic active sites. The catalytic performance of Mo-TiO_2/TUD-C was 8-fold higher than that unsupported Mo-TiO_2. Results strongly suggested that TUD-C played an important role as catalyst support for the homogenous dispersion of Mo-TiO_2 active sites, leading to the enhanced catalytic performance of Mo-TiO_2. It has been demonstrated that Mo-TiO_2/TUD-C was a good oxidative catalyst for styrene epoxidation at room temperature with high conversion and selectivity towards styrene oxide.

| TUD-C | oxidative catalyst | room temperature | styrene epoxidation | styrene oxide |