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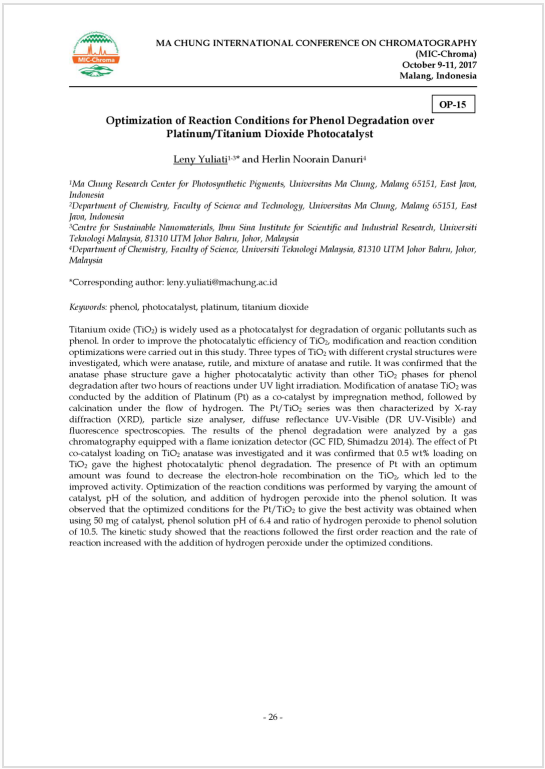

MA CHUNG INTERNATIONAL CONFERENCE ON CHROMATOGRAPHY
(MIC-Chroma)
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OP-15

Optimization of Reaction Conditions for Phenol Degradation over Platinum/Titanium Dioxide Photocatalyst

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Keywords: phenol, photocatalyst, platinum, titanium dioxide

Titanium oxide (TiO_2) is widely used as a photocatalyst for degradation of organic pollutants such as phenol. In order to improve the photocatalytic efficiency of TiO_2, modification and reaction condition optimizations were carried out in this study. Three types of TiO_2 with different crystal structures were investigated, which were anatase, rutile, and mixture of anatase and rutile. It was confirmed that the anatase phase structure gave a higher photocatalytic activity than other TiO_2 phases for phenol degradation after two hours of reactions under UV light irradiation. Modification of anatase TiO_2 was conducted by the addition of Platinum (Pt) as a co-catalyst by impregnation method, followed by calcination under the flow of hydrogen. The Pt/TiO_2 series was then characterized by X-ray diffraction (XRD), particle size analyser, diffuse reflectance UV-Visible (DR UV-Visible) and fluorescence spectroscopies. The results of the phenol degradation were analyzed by a gas chromatography equipped with a flame ionization detector (GC FID, Shimadzu 2014). The effect of Pt co-catalyst loading on TiO_2 anatase was investigated and it was confirmed that 0.5 wt% loading on TiO_2 gave the highest photocatalytic phenol degradation. The presence of Pt with an optimum amount was found to decrease the electron-hole recombination on the TiO_2, which led to the improved activity. Optimization of the reaction conditions was performed by varying the amount of catalyst, pH of the solution, and addition of hydrogen peroxide into the phenol solution. It was observed that the optimized conditions for the Pt/TiO_2 to give the best activity was obtained when using 50 mg of catalyst, phenol solution pH of 6.4 and ratio of hydrogen peroxide to phenol solution of 10.5. The kinetic study showed that the reactions followed the first order reaction and the rate of reaction increased with the addition of hydrogen peroxide under the optimized conditions.

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