Studi pengaruh penambahan bahan berbasis karbon pada karakterisik, aktivitas catalytic dan adsorpsi nanoparticle ZrO2 untuk aplikasi degradasi limbah pewarna methylene blue = Study on the effect of carbon based material addition on characteristics adsorptions and catalytic activities of ZrO2 nanoparticles for application in methylene blue dye wastewater treatment

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Abstrak

Komposit ZrO2/NGP dan ZrO2/graphene dengan masing-masing 5 massa dari NGP dan graphene telah disintesis dengan menggunakan metode sol-gel, dilanjutkan dengan metode kopresipitasi. Sampel tersebut dikarakterisasi dengan X-ray Diffraction XRD , Energy Dispersive X-ray EDX , Transmission Electron Microscopy TEM , Brunauer-Emmett-Teller BET , Fourier Transform Infrared FT-IR , UV-Visible Diffuse Reflectance UV-Vis dan Thermal Gravimetric Analysis TGA dalam rangka untuk menginvestigasi kristal struktur, komposisi atomic, morfologi, luas spesifik permukaan, mode vibrasi, nilai celah energi dan stabilitas panas dari komposit. Aktivitas catalytic dilakukan dengan menggunakan sinar ultraviolet photocatalytic , ultrasonic sonocatalytic dan gabungan antara ultraviolet dengan ultrasonic sonophotocatalytic sebagai sumber iradiasi pada proses degradasi limbah pewarna methylene blue MB . Hasil menunjukan bahwa ZrO2/graphene mampu menghadirkan kemampuan aktivitas catalytic dan adsorpsi yang lebih baik daripada ZrO 2/NGP dan ZrO2 pada proses degradasi MB. Pada aktivitas catalytic, ditunjukan bahwa sonophotocatalytic menghadirkan efisiensi terbagik, diikuti dengan sonocatalytic dan photocatalytic. Sebagai tambahan, efek dari, suhu kalsinasi, derajat keasaman pH , dosis katalis, konsentrasi MB, scavenger spesies aktif dan penggunaan kembali diinvestigasi dan hasilnya akan dibahas.
.....ZrO2 NGP and ZrO2 graphene composites with five weight percent 5 wt of NGP and graphene, respectively, where synthesized by sol gel method, followed by coprecipitation. The prepared samples were characterized by X ray Diffraction XRD , Energy Dispersive X ray EDX , Transmission Electron Microscopy TEM , Brunauer Emmett Teller BET , Fourier Transform Infrared FT IR , UV Visible Diffuse Reflectance UV Vis and Thermal Gravimetric Analysis TGA in order to investigate the crystal structure, atomic composition, morphology, specific surface area, vibration modes, bandgap energy value and thermal stability of the samples. The catalytic activities were performed using ultraviolet photocatalytic , ultrasonic sonocatalytic and the combination of ultraviolet and ultrasonic sonophotocatalytic as an irradation source in degrading methylene blue MB dye. The results showed that ZrO2 graphene could exhibit the best catalytic performance and adsorption than ZrO2 NGP and ZrO2 in degrading MB. In the catalytic activity, sonophotocatalytic exhibit the best catalytic performance, followed by sonocatalytic and photocatalytic. In addition, effect of contact time, calcination temperature, pH, catalyst dosage, MB concentration, scavenger of active species and reusability were investigated and the results were discussed.