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Synthesis of zno nanoparticles and their nanofluid stability in the presence of a palm oil-based primary alkyl sulphate surfactant for detergent application

Muhammad Triyogo Adiwibowo, author

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Abstrak

ZnO nanoparticles were successfully synthesized by a solochemical method using zinc chloride as the precursor in a sodium hydroxide solution with ZnCl2:NaOH ratios of 1:2 and 1:3. The effects of the thermal treatment on the functionalities of the nanoparticles were investigated by comparing calcined ZnO with uncalcined ZnO. Calcined ZnO underwent a drying process at 120°C, followed by calcination at 500°C, while uncalcined ZnO underwent the drying process only. The synthesized nanoparticles were characterized by XRD and FESEM-EDX analysis. The photoactivity of synthesized ZnO was evaluated through methylene blue degradation. In addition, ZnO nanofluids were synthesized by dispersing nanoparticles into the base fluid. The nanofluidic stability in the presence of a Palm Oil-Based Primary Alkyl Sulphate (palmPAS) surfactant were investigated using a spectrophotometer UV-vis with varied PalmPAS concentrations. XRD and FESEM analysis showed that the nanoparticles exhibited a hexagonal wurtzite structure, and confirmed that the particle size increased on calcination. All the synthesized ZnO nanoparticles exhibited good photoactivity under UV light irradiation due, to some extent, to their good crystallinity. The calcined ZnO from the ZnCl2:NaOH ratio of 1:3 offered the best photocatalytic performance compared to its ZnO counterparts. It was also found that the nanofluids of uncalcined ZnO from the ZnCl2:NaOH ratio of 1:3, at a ZnO:palmPAS ratio of 1:9, offered the best stability.