

## **Characterization of nano zero-valent iron (nZVI) and its application in sono-Fenton process to remove COD in palm oil mill effluent**

### **Abstract**

Nano zero-valent iron (nZVI) has received great attention for its capability to treat wastewater. One of its applications is in an advanced oxidation process (AOP) called the sono-Fenton process. This study presents the characterization of the nZVI particle by its particle size, scanning electron microscope (SEM) images, transmission electron microscope (TEM) images, X-ray diffraction (XRD), energy dispersive X-ray (EDX) and X-ray photoelectron spectroscopy (XPS) analysis. Results show that the average size of nZVI is 49 nm and it has two layers. The outer layer (shell) is comprised of iron oxides (i.e. FeO) while the core is elemental iron (Fe). At pH 2, nZVI was found to be a good replacement for iron sulfate ( $\text{FeSO}_4$ ) as a ferrous iron ( $\text{Fe}^{2+}$ ) source in the sono-Fenton process. In addition, the removal process of organic pollutants from diluted palm oil mill effluent (POME) was also accelerated by ultrasound, particularly at higher intensity and longer sonication time. Eighty percent (80%) of the chemical oxygen demand (COD) was removed in 2 h instead of 24 h by silent degradation.

**Keywords;** Nano zero-valent iron (nZVI), Sono-Fenton, Palm oil mill effluent (POME)