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Characterizations of High Entropy Alloy Powder as Catalyst Synthesized by Mechanical Alloying for Azo Dye Degradation

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Abstract
Fe27Co0.27Ni0.27Al0.1Si0.1 and Fe0.27Co0.27Ni0.27(Al0.08B0.02)0.1Si0.1 high entropy alloys were synthesized by mechanical alloying. Phase evolution, crystallite size, lattice strain, microstructure and morphology for the two alloys were investigated. The result shows that two simple structures which are FCC and BCC/B2 solid solution appear after 50 h of milling of Fe27Co0.27Ni0.27Al0.1Si0.1. The particle size of the alloy was increased after 20 h of milling time. The structural analysis shows that the average crystallite size decreases while lattice grain size increases with the increasing milling time. The morphology structure of the milled powders shows the particles size becomes rounded, flat and rough as the milling time prolongs. The newly developed HEA synthesized by mechanical alloying is expected to provide prominent efficiency in degradation of azo dyes (Methyl Orange). Although the HEAs have been reported to provide larger surface area and excellent capacity, only a few studies have been reported on degradation of azo dye by using HEAs as catalyst. According to this current finding, it is suggested that the produced Fe27Co0.27Ni0.27Al0.1Si0.1 and Fe0.27Co0.27Ni0.27(Al0.08B0.02)0.1Si0.1 can be applied as a catalyst in azo dye degradation. Therefore, the method derived from the results of this study will contribute in treating azo dyes for wastewater treatment. © 2022 Trans Tech Publications Ltd, Switzerland.

Author Keywords
azo dye; crystal structure; high entropy alloys; mechanical alloying; morphology

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