

2nd World Congress on Petrochemistry and Chemical Engineering

October 27-29, 2014 Embassy Suites Las Vegas, USA

Selective leaching of molybdenum from spent hydrosulphurisation catalysts using ultrasound and microwave methods

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Spent hydrosulphurisation (HDS) catalysts from petroleum refineries, mostly constituted by aluminium (Al), molybdenum (Mo), nickel (Ni) and cobalt (Co), are classified as hazardous wastes and disposal is restricted by environmental regulations; thus, the recovery of valuable metals is the most attractive option in the processing of these residues. Selective Mo leaching from two spent HDS (Ni–Mo or Co–Mo) catalysts, roasted at 500°C, was studied using three different approaches: conventional, ultrasound- and microwave-assisted methods. For the Ni–Mo or Co–Mo catalysts, 77% and 84% of Mo extraction, respectively, was achieved when a conventional (10 g/L NaOH, 80°C, 120 min, S/L=50 g/L) approach was used. For both catalysts, ultrasound-assisted leaching (pulse 0.5 s and 20% amplitude) with 10 g/L NaOH and S/L=50 g/L led to 66% Mo dissolution after 10 min. Under microwave-assisted (four cycles of 30 s) conditions, Mo leaching reached 89% and 91% for Ni–Mo and Co–Mo catalysts, respectively. The latter conditions represent the best compromise between Mo extraction and selectivity, since Al dissolution was between 6% and 9%.

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