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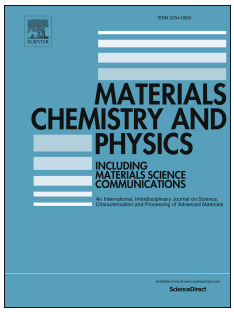

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Ultrasonic Spray Pyrolysis Synthesis of Nitrogen-Doped Porous Fe/C Composites from Glycerol for Hexavalent Chromium Removal

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Abstract

Nitrogen-doped porous carbon spheres impregnated with iron nanoparticles (Fe/C-N) are prepared from glycerol, a by-product of the biodiesel industry, and ferric ammonium citrate (FAC) *via* ultrasonic spray pyrolysis (USP). Carbon microspheres are generated during rapid (< 10 sec) pyrolysis of an aerosolized liquid precursor, resulting from acid induced dehydration, polymerization, and carbonization of glycerol. Fe/C-N composites are predominantly meso and macroporous, caused by iron-mediated carbon gasification during heating and salt templating. Iron impregnation (up to 6.6 wt%) and nitrogen doping (up to 3.3 wt%) are achieved simultaneously because FAC acts as both iron precursor and reducing agent. Reducing gases released from thermally decomposed FAC react with carbon surfaces to deposit nitrogen while facilitating *in situ* generation of Fe^0 and Fe_3O_4. Cr(VI) removal capacity up to 33 mg/g is reported, attributed to combined adsorption and reduction when applying Fe/C-N composites. The described synthesis, therefore, converts an industrial by-product into value-added materials with potential for use in environmental remediation.

Keywords: Ultrasonic spray pyrolysis, glycerol, ferric ammonium citrate, nitrogen-doped carbon, hexavalent chromium removal