Hybrid Iron Montmorillonite Nano-Particles as an oxygen scavenger

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PII: S1385-8947(18)31884-9
DOI: https://doi.org/10.1016/j.cej.2018.09.164
Reference: CEJ 20003

To appear in: *Chemical Engineering Journal*

Received Date: 3 July 2018
Revised Date: 23 August 2018
Accepted Date: 21 September 2018

Please cite this article as: E-M. Kombaya-Touckia-Linin, S. Gaucel, M.T. Sougrati, K. Khederlou, N. Pen, L. Stievano, N. Gontard, V. Guillard, Hybrid Iron Montmorillonite Nano-Particles as an oxygen scavenger, *Chemical Engineering Journal* (2018), doi: https://doi.org/10.1016/j.cej.2018.09.164

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Abstract (200 mots). Iron nanoparticles supported on montmorillonite (MMT-Fe) were synthesized via the reduction by sodium borohydride of iron salts dissolved in a suspension of MMT. The MMT-Fe black powder collected after the evaporation of the solvent was analysed by Transmission Electron Microscopy, which revealed the formation of aggregates of metallic nanoparticles with an average size of 57 ± 17 nm dispersed on the surface of MMT. According to the X-ray diffraction, no iron ions are intercalated in the interlayer spacing of MMT, and no other crystalline species are formed. ^{57}Fe Mössbauer spectroscopy evidences the formation of mainly zero valent iron in the form of iron boride. The O_2 absorption kinetic of the synthesized powders was found to follow a second-order law. The study of the O_2 absorption properties of as-synthesized, dried and stored (40 days) powders shows reaction constant (k), coefficient of proportionality (n) and O_2 absorption capacities of the same order of magnitude. The O_2 absorption capacity of the as-synthesized, dried and stored powders were found equal to 0.20 ± 0.01, 0.14 ± 0.03 and 0.09 ± 0.00 g O_2 per g of iron, respectively. The initial absorption rate was found within the range [0.5 - 1.5] % O_2 min^{-1} g^{-1}.

Keywords: Iron nanoparticles; Iron boride; Montmorillonite; Oxygen absorption kinetics; modelling ; chemical synthesis, ^{57}Fe Mössbauer spectroscopy