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ONE-STEP SYNTHESIS FOR FeBTC-MOF/IRON OXIDE COMPOSITE

Do Nascimento, R.F.F.(1); Gentil, G.(1); Júnior, S.A.(1); De Azevedo, W.M.(1); Rodrigues, A.R.(1); Campello, S.L.(2);
Universidade Federal de Pernambuco(1); Universidade Federal de Pernambuco(2); Universidade Federal de Pernambuco(3); Universidade Federal de Pernambuco(4); Universidade Federal de Pernambuco(5); Universidade Federal de Pernambuco(6);

In this work we present the assisted ultrasonic radiation synthesis for f Fe(BTC) (BTC = 1,3,5-benzenetricarboxilic acid) metal organic framework preparation. By definition Metal-organic frameworks (MOFs) belongs to a class of material prepared by the combination of metal ions and organic linkers to form a tridimensional framework which presents defined characteristics like crystallinity, high porosity and the presence of strong metal-ligand interaction. In the last decades the MOFs materials have received considerable attention not only due to scientific interest, but also because of their high potential for applications in several technological areas such us in gas storage, catalysis and drug delivery [1]. Among several Metal-organic frameworks (MOFs) the Fe-BTC structure seems to be one of promising materials, mainly due to their chemical and thermal stability [2], presents biocompatibility [3], can be used as drug delivery and as a contrast agent for magnetic resonance [4, 5]. Its functionalization has been reported in the literature by several works where the methods consist to mix the iron oxide Fe3O4 nanoparticles, in the solution contained the MOF'S precursor and the synthesis is prepared by solvotermal method [6, 7]. Typically, it has core-shell Fe3O4@MOF structures and exhibit magnetic properties. Our experimental technique proposed for the synthesis of the composite consists to use iron powder (?-Fe) as a target material dispersed in a solution of DMF/H2O (1:1) containing benzene 1,3,5 tricarboxilic acid and NaNO3. The synthesis was performed using a Ultrasound equipment model GEX500 500 W operating at 80 kHz, pulse 1s intervals for 60 min. The x-ray diffraction patterns and SEM measurements shown that the obtained materials are similar to those found in the literature and presents a rods likes morphology. The BET analysis indicate that the surface area is 1257 m^2g-1 and pore volume 1.4 cm^3g-1. Also the magnetic measurements indicates a paramagnetic characteristic strongly dependent on the initial synthesis parameters. Summarizing we have succeed to synthesized highly porous and magnetic Fe?BTC MOF/iron oxide composite using a simple sonochemical method. Reference [1] Huang, B., et al., Construction and Properties of Structure- and Size-controlled Micro/nano-Energetic Materials. Defence Technology, 2013. 9(2): p. 59-79. [2] Zhu, B.-J., et al., Iron and 1,3,5-Benzenetricarboxylic Metal–Organic Coordination Polymers Prepared by Solvothermal Method and Their Application in Efficient As(V) Removal from Aqueous Solutions. The Journal of Physical Chemistry C, 2012. 116(15): p. 8601-8607. [3]Anand, R., et al., Host–Guest Interactions in Fe(III)-Trimesate MOF Nanoparticles Loaded with Doxorubicin. The Journal of Physical Chemistry B, 2014. 118(29): p. 8532-8539. [4] Adhikari, C. and A. Chakraborty, Smart Approach for In Situ One-Step Encapsulation and Controlled Delivery of a Chemotherapeutic Drug using Metal-Organic Framework-Drug Composites in Aqueous Media. Chemphyschem, 2016. 17(7): p. 1070-7. [5] Horcajada, P., et al., Porous metal-organic-framework nanoscale carriers as a potential platform for drug delivery and imaging. Nat Mater, 2010. 9(2): p. 172-8. [6] Ke, F., et al., Fe3O4@MOF core-shell magnetic microspheres with a designable metal-organic framework shell. Journal of Materials Chemistry, 2012. 22(19): p. 9497-9500. [7] Yu, S., J. Wan, and K. Chen, A facile synthesis of superparamagnetic Fe3O4 supraparticles@MIL-100(Fe) core–shell nanostructures: Preparation, characterization and biocompatibility. Journal of Colloid and Interface Science, 2016. 461: p. 173-178.