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Electromagnetic properties of magnetite hollow nanospheres and porous nanospheres

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Two kinds of Magnetite nanospheres (hollow and porous) composed of primary nanocrystals have been successfully prepared via a one-step solvothermal method with gas-bubble template. $FeCl_3$.6H2O was used as single iron resource, polyvinylpyrrolidone (PVP) as the capping agent and urea, sodium acetate were serving as template in this process. To understand the formation mechanism of these nanospheres, the reaction parameters such as the concentration of precursor, gas source are investigated by fixing the reaction temperature and time. Sodium acetate has been played a dual role to control the size and morphology of the nanocrystals based on a gas-bubble Ostwald ripening process. We found that sodium acetate was useful in terms of precipitation of primary nanocrystals furtherly as template. The characterization of the as prepared product was identified with X-ray diffraction (XRD), transmission electron microscopy (TEM), field emission scanning electron microscopy (FE-SEM) and vibrating sample magnetometer (VSM). Due to the porosity, low density of these nanocrystals has been testing for microwave absorbing materials by using the Agilent vector network analyzer.

Keywords: Hollow nanospheres, Porous nanospheres, Ostwald ripening, Solvothermal method, Porosity