Structure and morphology of spinel $MgFe_2O_4$ nanoparticles for water purification

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In this work, spinel magnesium ferrite $MgFe_2O_4$ nanoparticles were synthesized by convential sol-gel methods. The study was focused on obtaining nanoparticles with the maximum content of specified ferrites, nanosized and uniform particles, with high crystallinity for water purification application.

The method is represented as a wet-chemical technique, where magnesium acetate and iron nitrate were used as precursors. In this process, the sole evolves gradually towards the formation of a gel like network containing both a liquid phase and a solid phase. The experimental procedure of modified sol-gel method consists of three stages. The 1st stage is the preparatory stage, which is the preparation of the chemicals to be added and mixed together in the three neck round bottomed flask. The 2nd stage is heating and stirring of the mixture for sol and gel formation using magnetic stirrer and hot plate. The final stage is anneling at 400-600 ºC for growth of magnetic nanoparticles.

Structul and morphology of $MgFe_2O_4$ nanoparticles were characterized by XRD and SEM. According to XRD pattern, the 100% of single cubic phase spinel ferrite with lattice constant of a=8.33747Å and Fdp3m symmetry with crystallinity 77.6%, has been achieved at pH=7.0, where ξ=0.0002mV, annealed at 600ºC. Also, SEM images showed the most uniform particle size distribution with crystallite size of 10-50 nm.

The photocatalytic activity of $MgFe_2O_4$ for water purification application was investigated photo-decomposition of methylene blue (MB) dye under solar light irradiation. Total degradation of MB was achieved in 2 hours and 15 min at concentration 0.4 g/L of photocatalyst. It is one of the promising photocatalysts for waste water treatment.

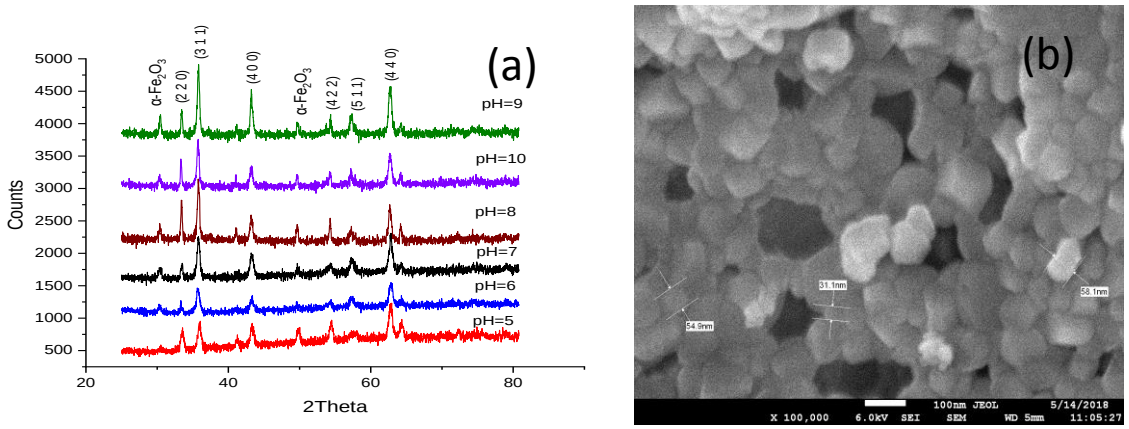

Figure 1. (a) X-ray diffraction patterns of $MgFe_2O_4$ nanoparticles synthesized at various pH and (b) SEM image of obtained $MgFe_2O_4$ powder