In the name of God

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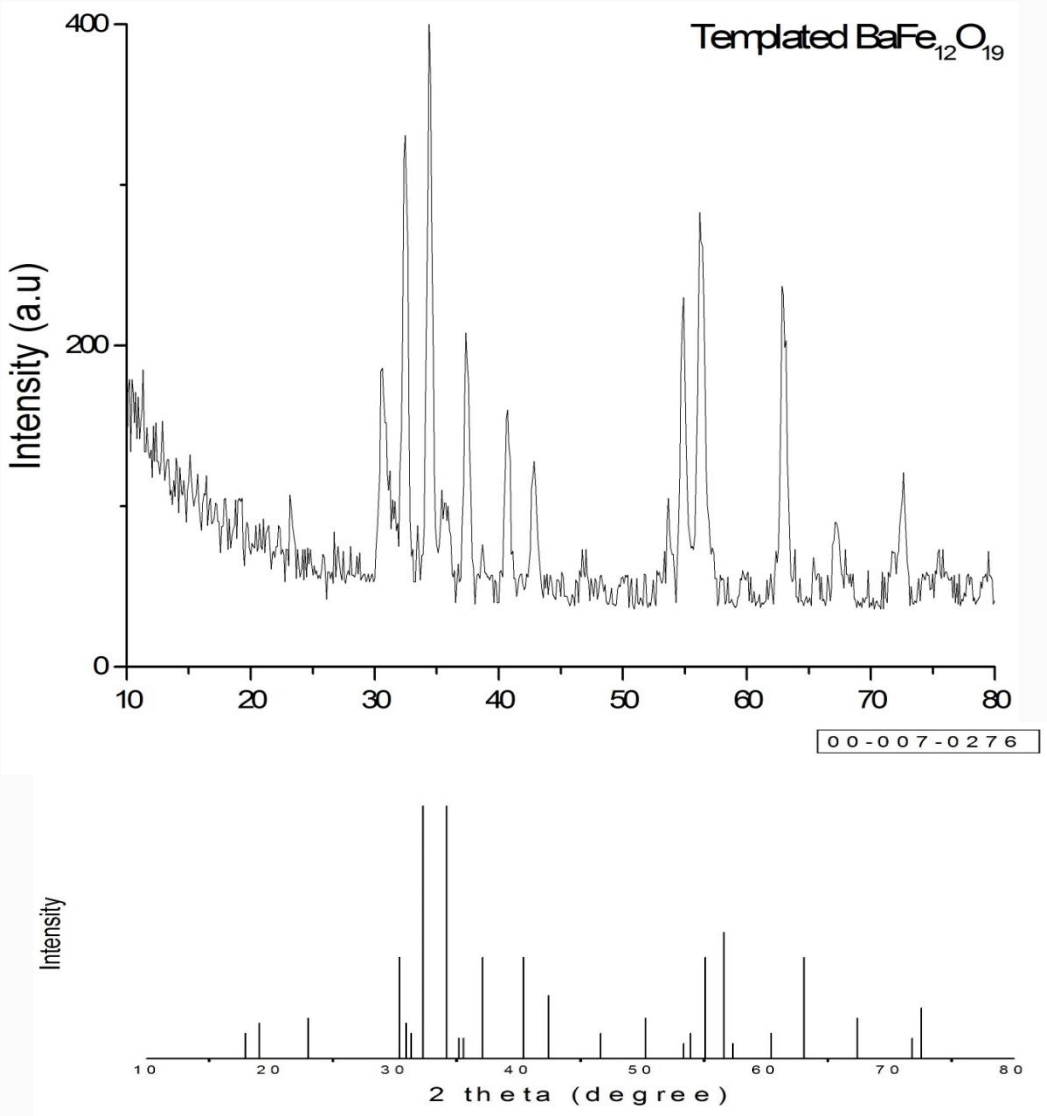
Welcome

Title:

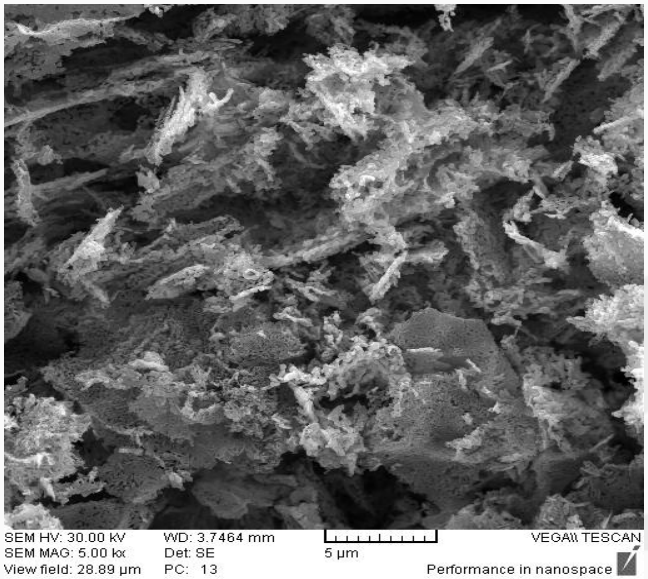
Preparation and characterization of templated barium hexaferrite ($BaFe_{12}O_{19}$) nanoparticles and investigation of its microwave absorption properties by silicone rubber matrix at x-band frequency

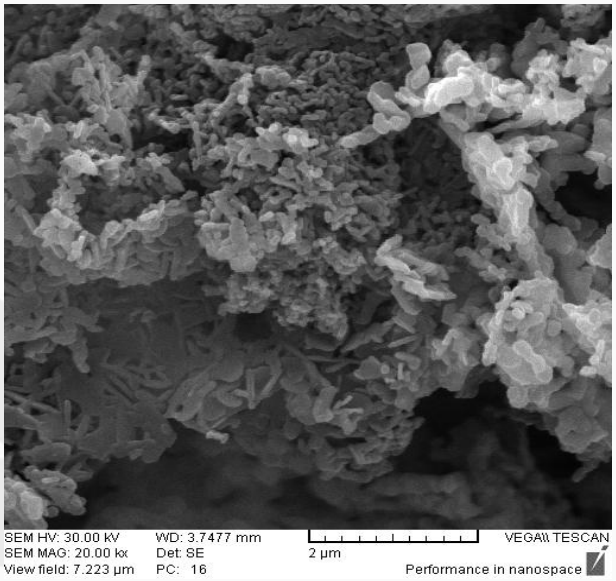
Recently, barium ferrite nanoparticles have attracted substantial attention because of widespread applications in catalytic degradations, credit cards, storage hardwares, sensors, microwave devices, permanent magnets, high frequencies, photocatalytic catalysts, and etc. In this research, templated $BaFe_{12}O_{19}$ nanoparticles were prepared through the sol-gel method by use of cotton as a template in the sol step. Finally, templated nanoparticles were blended in the silicone rubber matrix and then prepared nanocomposite molded to investigate of microwave absorption properties at x-band frequency. Templated barium hexaferrite nanoparticles were characterized by Fourier transform infrared (FT-IR), diffuse reflection spectroscopy (DRS), vibrating sample magnetometer (VSM), field emission scanning electron microscopy (FE-SEM), X-ray diffraction (XRD), and microwave absorption characteristics were obtained by vector network analyzer (VNA). Microwave absorption curves showed that templated $BaFe_{12}O_{19}$/silicone rubber nanocomposite absorbed 65.80% of microwaves at 9.87 GHz.

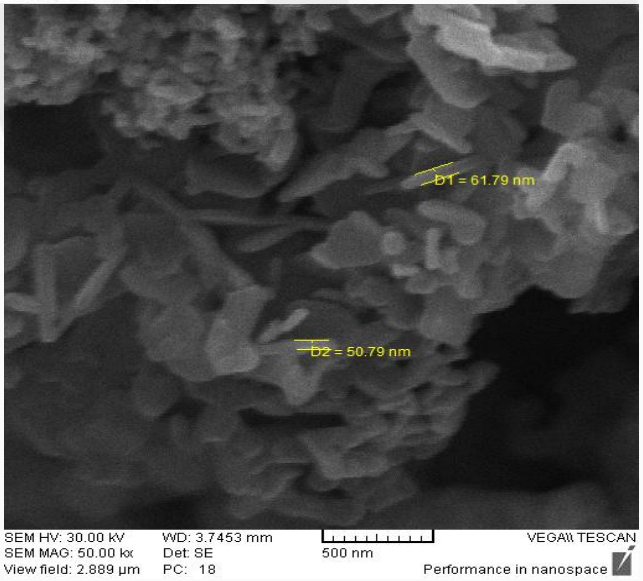
Phase identification



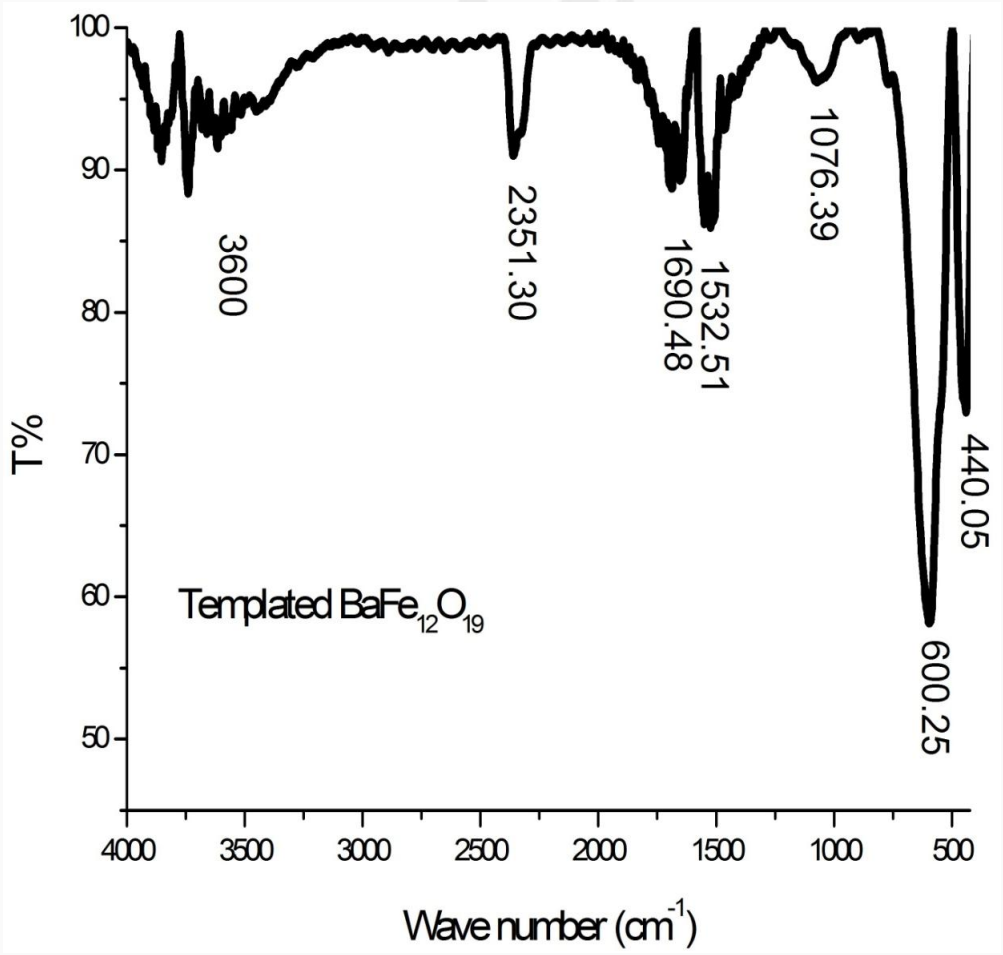
Investigation of morphology



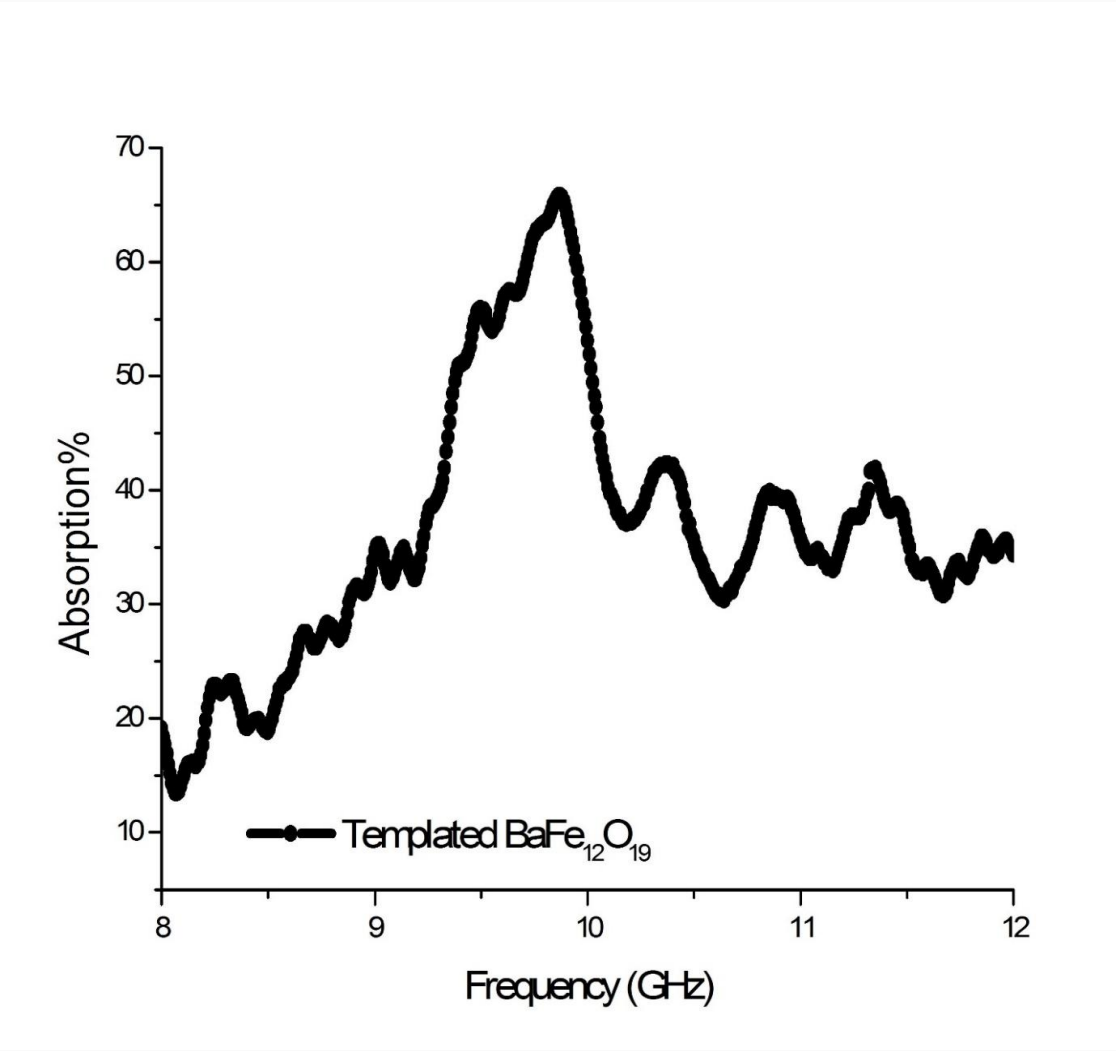




FT-IR analysis



Microwave absorption properties



Conclusion

Results indicated nano-size particles of barium hexaferrite have been synthesized at a relatively low temperature by use of novel template through the sol–gel combustion method. SEM confirmed uniform structure of templated nanoparticles has been prepared. According to the FT-IR spectrum all the carbonic precursors and other impurities were fully calcined. Base on the XRD pattern, mono phase crystal structure of barium hexaferrite was synthesized. Finally, VNA result showed that microwave absorption of templated $BaFe_{12}O_{19}$/silicone rubber nanocomposite was 65.80% at 9.87 GHz. Enhancing interfacial polarization by decreasing size of nanoparticles due to using natural organic template in one hand and use of silicone rubber with dielectric properties as a polymeric matrix in other hand caused $BaFe_{12}O_{19}$/silicone rubber nanocomposite have microwave absorption properties.

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