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## Gadolinium ferrite nanoparticles: Synthesis and morphological, structural and magnetic properties

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*Abstract* - In this study we report on the successful synthesis of  $\text{Gd}_x\text{Fe}_{3-x}\text{O}_4$  nanoparticles with nominal Gd-content ( $x$ ) in the range  $0.00 \leq x \leq 0.50$ . The effect of the nominal Gd-content on morphological, structural and magnetic properties was investigated by transmission electron microscopy (TEM), X-ray diffraction (XRD), Raman spectroscopy and Mössbauer spectroscopy. We found the actual inclusion of  $\text{Gd}^{3+}$  ions into cubic ferrite structure lower than the nominal values, though no extra phase was observed in the whole range of our investigation. Moreover, from Mössbauer data we found evidences of  $\text{Gd}^{3+}$  ions replacing both  $\text{Fe}^{3+}$  and  $\text{Fe}^{2+}$  ions, the latter leading to iron vacancies in the cubic ferrite crystal structure. As the nominal Gd-content, the lattice parameter and the average crystallite size increases monotonically. We found that in the same range of nominal Gd-content the lattice parameter decreases with the increase of iron vacancy content.

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