



Comment on “Structural, morphological and magnetic characters of PVP coated ZnFe_2O_4 nanoparticles” by R. Sagayaraj, S. Aravazhi, P. Praveen, and G. Chandrasekaran published in Journal of Materials Science: Materials in Electronics (2018) 29:2151

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The commented paper [1] presents the results on structural, morphological and magnetic studies on nanoparticles of Zn-doped Fe_3O_4 . However, the careful reading of this paper reveals various mistakes in the crystallographic part of results.

The main unacceptable mistake concerns the analysis of diffraction patterns presented in Fig. 1. of [1]. It is very difficult to correctly extract the diffraction peaks from the background in such patterns of rather poor quality. It seems that some of apparent “small” peaks of background were treated, by accident, as the peaks from the studied compound. In general, there are no significant differences in the patterns from different samples, contrary to the belief of Authors.

There is also a major problem with the stoichiometry of the studied nanocrystals and its correct chemical formula. Authors believe that the studied crystal is ZnFe_2O_4 as stated in the title of paper, in the Introduction and chapter devoted to the synthesis of nanoparticles. However, the captions of figures use the formulas like $\text{Zn}_x\text{Fe}_2\text{O}_4$, where x indicates on the level of doping. This is the wrong formula; in this case the correct one should be $\text{Fe}_3\text{O}_4:\text{Zn}$. Unfortunately, the diffraction patterns do not correspond to any known ZnFe_2O_4 phase, nor to Fe_3O_4 phase. However, the presented pattern seems to be similar to that from orthorhombic CaFe_2O_4 , due to two peaks of nearly equal intensities observed in the vicinity of $2\theta \approx 35^\circ$. The authors assumed that their nanocrystals are of cubic symmetry. I think that it is a wrong assumption and the symmetry is lower, *e.g.* tetragonal or orthorhombic.

There is also a misunderstanding on the quality of results from the calculation of average crystallite size by Scherrer formula. The systematic errors for this evaluation are so high that the values could not be presented with decimal digits. More precise values are out of scientific meaning [2]. Thus, the real apparent value is nearly the same for all studied samples – 9 to 13 nm. Thus, there is no significant dependence on Fe content contrary to the belief of authors. The size of crystallites of the sample doped by 1% of Zn is erroneously high, perhaps due to the error in the 2θ -angle (32 instead of 35°).

There are, also, some typographical errors (*e.g.* 2θ -angle should be of about 35° instead of 335°), misleading units used in the Table 1, and incorrect expressions (*e.g.* structural length, peaks from amorphous phase).

In conclusion, it seems that the commented paper has limited scientifically valuable information in the crystallographic part of the paper.

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References

1. R. Sagayaraj, S. Aravazhi, P. Praveen, G. Chandrasekaran, J. Mater. Sci.: Mater. Electron. **29**, 2151 (2018)
2. P.E. Tomaszewski, Phase Transit. **86**, 260 (2013). <https://doi.org/10.1080/01411594.2012.715301>

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