

Structural and electric properties of combustion synthesis derived nanocrystalline $\text{Ni}_{0,3}\text{Zn}_{0,7}\text{Fe}_2\text{O}_4$ – investigation of optimal calcination process parameters

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Abstract:

Ni-Zn ferrites due to its adherent soft magnetic material properties for many years have been extensively used in the magnetic, electronic materials industries¹⁾. To modify NiZn ferrite physical and chemical properties, as well as expand application area, NiZn ferrite particles and crystallites need to be in nanometer dimensions. Moreover, nanocrystalline ferrites are considered as attractive gas sensors²⁾.

To obtain different microstructured and nanostructured ferrite compounds, various synthesis methods have been used. Most popular of them are coprecipitation, precursor, sol-gel and hydrothermal method. Mentioned methods have various typical drawbacks, that is the reason why recently to obtain different ferrite compounds, combustion synthesis method was introduced. Combustion method is based on dissolving of correspondent metal salts and organic complexing agent; obtaining dried gel from achieved solution; temperature initiated oxidation-reduction reaction, which results in oxide mixture formation and finally - mixture calcinations³⁾.

In this work, we report the results of combustion synthesis of NiZn ferrite using metal nitrates and citric acid as starting materials. Structural analyses were performed by X-ray diffraction and FTIR showing that pure NiZn ferrite phase forms after calcination at 1300°C.

Electrical resistivity and specific surface area of obtained products decreases by increasing calcination temperature and reducing heating rate.

References:

1. M.M.Mallapur, P.A.Shaikh, R.C.Kambale, H.V.Jamadar, P.U.Mahamuni, B.K.Chougule. Structural and electrical properties of nanocrystalline cobalt substituted nickel zinc ferrite. J ALLOY COMPD. 2009, 479, 797-802.
2. V.D.Kapse, S.A.Gosh, F.C.Raghuwanshi, S.D.Kapse, U.S.Khandekar. Nanocrystalline $\text{Ni}_{0,6}\text{Zn}_{0,4}\text{Fe}_2\text{O}_4$: A novel semiconductor material for ethanol detection. TALANTA. 2009, 78, 19-25.
3. E.Sileo, R.Rotelo, S.Jacobo. Nickel zinc ferrites prepared by citrate precursor method. PHYSICA B. 2002, 320, 257-260.