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软磁Mn-Zn铁氧体纳米晶的低温自蔓延合成及表征

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摘 要：采用低温自蔓延方法合成了Mn-Zn铁氧体纳米晶,对其进行了X射线衍射(XRD),X射线能谱(EDS),电子自旋共振波谱(ESR)和透射电镜(TEM)等测试.研究结果表明:铁氧体化学式为(MnZn)0.5Fe2O4;铁氧体结晶状况良好;铁氧体的g值为9.956 0;铁氧体纳米晶粒径较均匀,为10~20 nm,与Scherrer公式计算所得晶粒尺寸(16.9 nm)相符;合成铁氧体的g值远大于自由电子的g值(ge=2.002 3),初步推断是Mn^{2+},Fe^{3+}的3d5半充满价电子层结构和它们在尖晶石型晶胞$(MnZn)_{0.5}Fe_2O_4$中的磁矩偶合作用所致.

关键字：低温自蔓延合成;软磁铁氧体;纳米晶;g因子

Low temperature self-propagating synthesis and characterization of soft-magnetic Mn-Zn ferrite nanometer-sized crystal

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Abstract: Nanometer-sized crystal of Mn-Zn soft-magnetic ferrite was synthesised using low temperature self-propagating method, which was characterized by the XRD, EDS, ESR and TEM tests. The results show that the ferrite is well crystallized and its chemical formula is (MnZn)0.5Fe2O4and its gvalue is 9.956 0 and its particle size is about 10-20 nm which is coincided with the result of crystal particle size of 16.9 nm calculated by the Scherrer formula. Thegvalue of the synthesised ferrite is far larger than that of the free electron, which is mainly caused by the common influence of the 3d5half-filled valence electron layer structure and the magnetic moment coupling effect of Mn^{2+} and Fe^{3+} in the spineltype crystal of $(MnZn)_{0.5}Fe_2O_4$.

Key words:low temperature self-propagating synthesis; soft-magnetic ferrite; nanometer-sized crystal;gvalue

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