Ln～nMCo～nO～3n+1(Ln=Sm, GD; M=Sr, Ba; n=1,2)的合成、结构、电和磁性质研究

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摘要　　用固相反应法合成了三个新的交生相氧化物: $Sm_2SrCo_2O_7$,$Gd_2SrCo_2O_7$和$Sm_2BaCo_2O_7$。它们均具有$Sr_3Ti_2O_7$型的结构, 其中$Sm_2BaCo_2O_7$属于正交晶系, 其他属于四方晶系。与$LnSrCoO_4$相比, $Ln_2SrCo_2O_7$(Ln=Sm, Gd)中CoO_2平面上的Co-O键缩短, 电子离域化趋势增强, 导电能力提高。在300-1100K之间, 电阻率与温度关系表明, 五个氧化物均表现弱定域系统的特性。300-1100K之间的磁化率与温度关系表明, 在较低温度下, $GdSrCoO_4$和$Gd_2SrCo_2O_7$符合Curie-Weiss定律, 但前者的CoO_2平面上的磁交换作用是反铁磁性的, 而后者是铁磁性的; 含Sm^{3+}的三个氧化物表现出较为复杂的磁性质, 这可能与Sm^{3+}离子磁性的复杂性有关。

关键词　 氧化钴　氧化钡　氧化锶　氧化镉　相结构　磁化强度　氧化钐　电磁性质

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Studies on the synthetic, structural, electrical and magnetic properties of Ln～nMCo～nO～3n+1(Ln=Sm, GD; M=Sr, Ba; n=1,2)

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Abstract Three new oxides $Sm_2SrCo_2O_7$, $Sm_2BaCo_2O_7$ and $Gd_2SrCo_2O_7$ have been synthesized successfully by solid state reaction mathod. The X-Ray diffraction spectra show that they are all isostructural with $Sr_3Ti_2O_7$, and $Ln_2SrCo_2O_7$ (Ln=Sm, Gd) crystallized in tetragonal system, $Sm_2BaCo_2O_7$ in orthrhombic system. The Co-O bonds in CoO_2 planes of $Ln_2SrCo_2O_7$ are shorter than those of $LnSrCoO_4$ (Ln=Sm, Gd), and so their delectrons are more delocalized and their electrical resistivities are smaller. The electrical resistivities versus temperature in the range 300-1100K showed that the five oxides show the characters of weakly localized systems. In the lower temperature range, the magnetic behaviors of $Gd_2SrCo_2O_7$ and $GdSrCoO_4$ fit Curie-Weiss law well, and the magnetic exchange reaction in CoO_2 sublattices of $Gd_2SrCo_2O_7$ is ferromagnetic, but that of $GdSrCoO_4$ is antiferromagnetic. The other three oxides with Sm^{3+} showed complex magnetic behaviors which is perhaps related with the complexity of Sm^{3+}.

Key words　COBALT OXIDE　BARIUM OXIDE　STRONTIUM OXIDE　CADMIUM OXIDE　PHASE STRUCTURE　MAGNETIZATION　SAMARIUM OXIDE　ELECTROMAGNETIC PROPERTIES

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