phase transition to lower temperatures and modify the hysteresis loop. The tetragonal form is thus strongly stabilized via the addition of dopants. The tetragonal c/a ratio also increases with doping at 3% mol. An analysis of the isotropic atomic displacement parameters for the tetragonal phase indicates that in the case of oxygen the values are greater for doped samples. These higher values are most probably linked to additional static disorder resulting from modifications to the oxygen sublattice as a consequence of doping. It can be noted that doping had already resulted in an increase in B_{iso} for oxygen of 0.2-0.3 Å^2 at ambient temperature in the monoclinic phase. There are no significant effects of doping on the B_{iso} of Zr. The results, in particular the possible increase in static disorder, are linked to changes in electrical conductivity measured under the same conditions by complex impedance spectroscopy. Thus, structure-property relationships can be developed in order to optimize these materials for high-temperature refractory applications.

Keywords: zirconia; neutron powder diffraction; high-temperature crystallography

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Magnetic and Magnetocaloric Result of Magnetic Field-induced Transitions in $La_{1-x}Ce_xMn_2Si_2$.

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Rare earth-based intermetallic compounds are having great attention due to their potential for various applications. Among ternary intermetallic compounds, the RMn_2X_2 compounds (R=rare-earth,X=Si or Ge) have been extensively studied because of their interesting physical properties ranging from superconductivity to heavy fermion behavior [1]. Ternary RMn_2X_2 compounds crystallize in the body-centered tetragonal $ThCr_2Si_2$-type structure (space group: I4/mmm), which is characterized by stacked R–X–Mn–X–R layers along the c axis. Magnetic structure of these compounds contains two interacting magnetic subsystems: One of them is composed of rare-earth atoms and the other one is manganese atoms. The magnetic ordering of the Mn sublattice can take up various configurations, as a result the nature of the magnetic ordering is closely related to the Mn–Mn separation. Since, the magnetic ordering of Mn sublattice is very much dependent on the lattice parameters, the overall magnetic state of these compounds is quite sensitive to temperature, due to the thermal variation of lattice parameters. In this study we investigate the $La_{1-x}Ce_xMn_2Si_2$ (x=0.35 and 0.45) where we expect a variety of magnetic structures to appear in these compounds since they may exhibit quite interesting magnetic and magnetocaloric properties. Among this series $LaMn_2Si_2$ is ferromagnetic with T_C=310 K and $CeMn_2Si_2$ is a mixed valent compound with T_N=376 K [2]. All compounds investigated crystallize in the $ThCr_2Si_2$ -type structure with the space group I4/mmm. Substitution of Ce instead of La leads to a linear decrease in the lattice constants and the unit cell volume. Magnetic properties have been examined between 5 and 350 K in 50 Oe. In both samples shows multiple AF-FM state transitions and field-induced transition from the AF to the FM state. The isothermal magnetic entropy change is found and both samples show inverse and conventional magnetocaloric effect around transition temperature. Finally we have used Landau theory on magnetic entropy changes around magnetic transitions.

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Keywords: field-induced magnetic transitions; magnetocaloric effect

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Synthesis, Crystal Structure and Vibrational and Optical Spectra of $Sr_{0.5}Zr_2(AsO_4)_3$.

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Nasicon-type materials have been extensively studied as solid electrolytes, ionic conductors, electrode materials, low thermal expansion ceramics, sensors, etc. In contrast to the extensive studies of the Nasicon-type phosphates and silicates, only few investigations have been reported for the arsenates analogues [1-8]. We described in a previous work the structure of $NaZr_2(AsO_4)_3$ [9]. Substitution of Na^+ by divalent ions in $NaZr_2(AsO_4)_3$ led to the synthesis of new arsenates $M_{0.5}Zr_2(AsO_4)_3$ (M = Ca, Cd, Sr,…). The present paper reports on the synthesis, crystal structure and vibrational and optical spectra of $Sr_{0.5}Zr_2(AsO_4)_3$.

Crystalline powder of $Sr_{0.5}Zr_2(AsO_4)_3$ was prepared from solutions of $SrCO_3$ (or $SrCl_2.H_2O$), $ZrOCl_2.8H_2$ and $(NH_4)H_2AsO_4$. Stoichiometric proportions of these reagents were dissolved in dilute nitric acid solution (6M) for the carbonate and in distilled water for the other reagents. The mixture of theses solutions was heated at 60°C until complete evaporation. The white solid obtained was successively sintered at 100, 300, 500 and 700°C, for 24 hours with intermediate grinding, to obtain microcrystalline powder of $Sr_{0.5}Zr_2(AsO_4)_3$. Its structure, which belongs to the Nasicon-type family, was refined by the Rietveld method in the R-3 space group, from X-ray powder diffraction data. The hexagonal unit-cell parameters were determined to be a_h = 8.965(2) Å, c_h = 23.955(6) Å, V = 1667.43(6) Å^3, and Z = 6. The structure is formed by an ionic three-dimensional network of AsO_4 tetrahedra and ZrO_6 octahedra linked by corners with Sr^{2+} ions occupying half of the M1 sites in an