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ABSTRACTS

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IP-38. MAGNETIC PHASE TRANSITION IN SINGLE CRYSTAL (Nd1-xSmx)1/3Sr2/3FeO3. Young Rang Umh, Chul Sung Kim (Kookmin University, Dept. of Physics, Songguk-su, Seoul 136-702, South Korea) and Y. Tomioka, Y. Tokura (Joint Research Center for Atom Technology, (JRCAT), Tsukuba, Ibaraki, 305, Japan)

The single crystals of (Nd1-xSmx)1/3Sr2/3FeO3 were synthesized by floating zone (FZ) method and their magnetic properties and charge ordering (CO) transition related with lattice dynamics was systematically investigated. Mössbauer spectra of (Nd1-xSmx)1/3Sr2/3FeO3 were taken various temperatures range of 12 K to room temperature. The charge disproportionation (CD) was detected below Néel temperature TN, in which two kinds of iron with valence states Fe3+ and Fe2+ were found with ratio of 2:1. The (Nd1-xSmx)1/3Sr2/3FeO3 (x=0.0, 0.2, 0.4, 0.6, and 0.8) with least lattice distortion undergoes a charge ordering (CO) phase transition at and below TCO=TN and accompanying the charge disproportionation into nominally Fe3+ and Fe2+ sites as well an antiferromagnetic spin ordering. In this charge ordering state, a sequence of Fe3+Fe2+Fe3+Fe2+Fe3+Fe2+... exist along the [111] direction of pseudo cubic perovskite structure. In this study, the CO at x=0.23 disappears in case of R=Sm. Indeed, such disappearance of CO transition was detected by systematic decrease of a spontaneous magnetization with increase of y in the system of (Nd1-xSmx)1/3Sr2/3FeO3. This result shows that the charge ordering state is realized with strong hybridization between Fe and O atoms.

IP-39. MAGNETIC PROPERTIES OF K-ABSORBING ZEOLITE LTA. Hiroshi Kira, Hideki Tou, Yutaka Maniwa (Tokyo Metropolitan Univ., Dep. of Physics, Minami-osawa, Hachioji, Tokyo, 192-0397, Japan) and Youshi Murakami (KEK, Photon Factory, Minami-ossawa, Tsukuba, Ibaraki, 305-0801, Japan)

A ferromagnetic (FM) like transition around 7K in potassium-loaded zeolite LTA was reported by Nozue and coworkers in 1992 and 1993 (Phys. Rev. Lett. 68 (1992)789). However, no other groups have reported a confirmation of this transition and detailed dependence of the magnetic properties on K-loading density that was reported by Nozue and his coworkers. Very recently, the present authors succeeded in this confirmation and also found a coexistence of a structural modulation and the ferromagnetism (Y. Maniwa et al., J. Phys. Soc. Jpn. 68 (1999)2902). The magnetic moment responsible for the magnetism is believed to be located in cavities formed by the (Si/Al-O-) network. However, the magnetic structure and mechanism have not yet been clarified. In this viewpoint, NMR studies were performed. Silicon-29-NMR spectra clearly indicated the bulk magnetic transition: the line width was broadened steeply at the transition. In the ordered state, the line shape is nearly symmetric while those are asymmetric above the transition temperature. The simulation strongly suggested that there are at least two types of cluster with different magnetic moment.

IP-40. ANTI-FERROMAGNETIC-FERROMAGNETIC CROSSOVER IN UO2-TiO2 MULTIPHASE SYSTEMS. Akio Nakamura, Satoshi Tsutsui, Kenji Yoshii (Japan Atomic Energy Research Institute, Dept. of Materials Science, Ibaraki, Tokai-mura, 319-1195, Japan)

A new magnetic phenomenon (anti-ferromagnetic-weakly ferromagnetic crossover) has been found for UO2-TiO2 multi-phase systems, (1-y)UO2-yTiO2 (x=0.2-0.6, y=0.05-0.80). Samples of the present study were prepared by the usual ceramic method: The starting materials are TiO2 powders (T7, T0, TiO2) and TiO2 (x=0.0, 1.0, 1.5, 2.0, respectively), SN, Soekawa and stoichiometric UO2 powder obtained from chemically pure grade uranyl nitrate. The pellets of these starting mixtures were heated at 1400-1450°C in a vacuum better than 10⁻⁵ Torr. Their powder X-ray diffraction (XRD) analyses showed that the only compound formed is UTi2O6 (brannerite, y=0.67) between UO2 and TiO2 (x=2). So, the phase assembly of these systems are considered to be: for x=0, 1.0, and 1.5, the heterogeneous two phase mixture of UO2 with TiO2 for all the y, and for x=2, that of UO2 with UTi2O6 for y less than 0.67, and for y larger than 0.67 that of UTi2O6 with TiO2 (plus minor UO2, for UTi2O6 could not be prepared as a single phase material even at y=0.67 in the present heating condition). First, using a SQUID magnetometer (MPMS Quantum Design), DC magnetization (M) of the present UO2 powder was measured both before and after heating; the two were confirmed to exhibit nearly identical sharp M drop at TM (30.5-30.8K) typical for antiferromagnet over the field (H) range of 0.01-5 Tesla. Tc, as reported previously on this system. In contrast, M of these multi-phase systems were found to exhibit a sharp increase (upturn) at the respective TN, while the values of their Tc remain almost constant with varying y at most between 30.5 and 29.8 K. This M upturn at TN is most pronounced for UO2 having Ti oxide partners (x=1.0, 1.5(Ti2O3) and 2(TiO2)) with their nearly equal molar-admixtures ratio of TiO2 and UO2 (x=TiO2/2(UO2+x=1)). i.e., for r(1.0)(y=0.5). For Tc of r(1.0) to much lesser extent. In these most optimized cases, (r=1.0 for x=0.0, 1.0, 1.5, 2.0) this M upturn at TN extends up to H=4T at maximum, and above 3T the original antiferromagnetic M-drop phenomenon at TN as observed in pure UO2 is recovered. It is apparent from these observations that an antiferromagnetic-weakly (parasitic) ferromagnetic crossover phenomenon is induced for UO2-TiO2 multi-phase systems, (especially for the oxide partners), plausibly owing to the magnetic modification of UO2 at the interface region in contact with the oxide partners. The detailed nature and origin of this new finding, however, are yet to be clarified in the future.

IP-41. HIGH-PRESSURE STUDIES OF KONDO-LIKE SEDROVITE (La0.1Ce0.4Sr0.5MnO3). Tetsujirou Ito (University of Kyusyu, Research Center for Materials Engineering, Fukuoka 4-2-1, Fukuoka, 810-8560, Japan) and Gendo Oomi, Fuminori Honda, Isao Kosaka (University of Komatao, Dept. of Mech. Engineering and Mater. Sci., Kurokami 2-39-1, Kumanowo, 860-8555, Japan) and Athinarayanan Sundaresan (Agency of Industrial Science and Technology, Electrotechnical Laboratory, Umezono 1-1-4, Tsukuba, Ibaraki, 305-8568, Japan).

Recently, investigations of hole-doped perovskite manganese R1−xAxMnO3 (where R is a trivalent rare earth and A is a divalent alkaline earth) have been carried out extensively [1,2]. Interesting facts such as Kondo-like effect and an anomalous ordering of cerium were observed in (Pr0.1Ce0.4Sr0.5MnO3 [2]. In the present study, pressure dependence of the lattice parameters, the thermal expansion and the resistivity for a related material (La0.1Ce0.4Sr0.5MnO3 were measured in order to clarify the origins of this behavior. The specimen of (La0.1Ce0.4Sr0.5MnO3 polycrystalline was prepared by the solid state reaction method of the stoichiometric mixtures. Thermal expansion and electrical resistance were measured by strain gauge method and standard four-probe method, respectively. The details of high-pressure experiment was reported previously [3]. Significant changes in the lattice parameters were observed at high pressure, although the details are now under analyzing. The resistivity increased smoothly with decreasing temperature, which is in contrast to the metallic behavior. This anomalous behavior of resistivity may be results from Kondo scattering of conduction electrons by the localized Ce3+ moments, that is, as reported in ref. [2].