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ORAL PRESENTATION - Local Fields at Nonmagnetic Probe Sites in a Perovskite La0.7Ca0.3MnO3

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Perovskite manganese oxides (AMnO3) are known to exhibit the effect of colossal magnetoresistance (CMR), a phenomenon that electrical resistivity undergoes a drastic change as large as five to six orders of magnitude by an applied magnetic field. Because of this unique physical property, much attention has been given to these oxides aiming at wide industrial applications. In order to realize practical use of these compounds, it is of importance to obtain information on local fields in the material as well as macroscopic quantities such as resistivity and magnetization.
From this point of view, we have applied the time-differential perturbed angular correlation (TDPAC) method to a study of a perovskite La0.7Ca0.3MnO3, which exhibits the CMR effect by the paramagnetic-ferromagnetic phase transition (Tc ˜ 245 K). In our previous work, we successfully observed drastic change in the local field at the probe nucleus, 140Ce, between temperatures above and below Tc, which evidently suggests that the magnetic field produced by spins in Mn ions can be transferred to the probe at the A site. Since the 140Ce probe arising from the disintegration of 140La takes two possible oxidation states, 140Ce3+ and 140Ce4+, however, it remains unknown whether the observed magnetic field (= 6.9 (3) T at 240 K) is exclusively transferred from Mn spins or is produced in part by a 4f electron spin localized at the probe in the chemical state of 140Ce3+. In the present work, therefore, we employed nonmagnetic 111Cd(←111mCd) and 111Cd(←111In) as the probe nuclei to shed light on the local field without self-owned spins. In the session, the effect of the 4f electron is discussed.

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