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Far- and mid-infrared emission and reflection of magnetoelectric $RMnO_3$ and $RCrO_3$ (R=Rare Earth) NESTOR E. MASSA, LANAIS EFO-CEQUINOR, UNLP, La Plata, Argentina, LEIRE DEL CAMPO, DOMINGOS DE SOUSA MENESES, PATRICK ECHEGUT, CNRS-CEMHTI, Orléans, France, MARIA JESUS MARTINEZ-LOPE, JOSE ANTONIO ALONSO, ICMM-CSIC, Madrid, Spain — Far- and mid-infrared emission and reflection spectra of ferrielectric hexagonal $TmMnO_3$ show that small polarons, a paramagnetic collective electronic mode, and lower than T_N soft hybrid modes are in concomitant relation. CO_2 laser heating in dry air triggers oxidation and Mn^{3+}- Mn^{4+} double exchange hopping conductivity. A collective excitation in the paramagnetic phase is assigned to e_g electrons in THz low energy d-orbital fluctuations. It locks-in at the E-type antiferromagnetic onset ($T_N \sim 80$K) into soft bands that harden simultaneously down to 4 K with temperature dependence given by the magnetic long range order coupling of the collective electric dipole. They have T_N as critical temperature and critical exponents suggesting a second order phase transition. They also match zone center spin wave modes measured in isomorphous $LuMnO_3$ (Lewtas et al, Phys. Rev. B **82**, 184420 (2010)). Both excitations, magnons y electric dipoles, are generated by electrons e_g in deformed d-orbitals. Sharing this behavior with orthorhombic $NdMnO_3$ there is no evidence of new phonons in a structural deformation down to 4K Preliminary results in $ErCrO_3$ ($T_N \sim 130$ K) show the emerging soft bands in an order-disorder scenario. Overall, we conclude that magnetoelastic deformations in an orbital fluctuating environment are close related to magnetoelectric couplings.

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