Elena Zhukova
(Russian Academy of Sciences, Moscow)

Interplay of charge order and crystal lattice dynamics in overdoped manganites $La_{1-x}Ca_xMnO_3$ (0.5<x<1)

As opposite to underdoped manganites that reveal the CMR properties, $R_{1-x}A_xMnO_3$, R rare earth, A alkaline, x<0.5, the overdoped members (x>0.5) of the family are much less examined. Presently, they start to attract increasing attention as a unique playground to study how different order parameters of comparable strength (charge, spin, orbital, phonon) compete while forming the ground state of the system. Mechanisms of formation of various ordered phases in the x>0.5 compounds are not yet established. As a possibility, it was suggested (see, for example, [1]) that the driving force for the charge ordering could be of the Peierls-Frohlich type, and the resonance absorptions observed in the meV range were considered as correspondent pinned phason modes [2]. Our terahertz spectroscopic measurements for $La_{1-x}Ca_xMnO_3$, x(Ca)=0.75, have shown, however, that the resonances are not more than acoustic folded phonons that become optically active due to superstructure in the crystal lattice [3]. Now, we report on similar spectroscopic results obtained for a series of compositions $La_{1-x}Ca_xMnO_3$: x(Ca)=1/2, 0.6, 2/3, 0.85, 0.9, 0.95, 0.98 and x(Ca) = 1 ($CaMnO_3$). We demonstrate appearance at terahertz and far-infrared frequencies in the charge-ordered phase of series of resonances and show that they, as in the x=0.75 compound, are regular acoustic phonons folded to the k=0 point of the folded Brillouin zone. Features of phonon and free charge carriers optical response in cases of commensurate and incommensurate concentrations x(Ca) will be discussed.

[1] G.C. Milward, M.J.Calderón, and P.B. Littlewood, Nature London **433**, 607 (2005)
[2] N. Kida, M. Tonouchi. Phys. Rev. B **66**, 024401 (2002); A. Nucara et al., Phys. Rev. Lett. **101**, 066407 (2008)
[3] T. Zhang et al., Phys. Rev. B **81**, 125132 (2010)

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Universität Stuttgart, NWZII, Raum 3.531
Pfaffenwaldring 57, 70569 Stuttgart