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Polarized Raman Spectra of Perovskite Relaxor Ferroelectrics

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Pseudo-binary solid solutions of perovskites ferroelectrics are often showing either a ferroelectric transitions with a glassy dynamics or enhanced piezoelectric properties. Because of the demonstrated application potential of (1–x)Pb(Zn1/3Nb2/3)O3–xPbTiO3 and related materials, considerable research efforts are still payed to the understanding these phenomena.

The IR spectroscopy of such lead-based perovskites is relatively well understood[1], but the assignment of Raman spectra remains a rather difficult task. The Raman activity seems to originate from both the occupational ordering [2] and the ionic off-centering [3]. The weight of these effects is varying from one material to another. Morever, the inherent disorder seems to lift the strict Raman selection rules. Interestingly, the polarized Hyper-Raman scattering spectra obey the standard polarization selection rules rather well [4,5] Nevertheless, Raman scattering in relaxors shows a measurable polarization dependence and it has been argued that specific features of polarised Raman scattering can be even employed for example to probe relaxor to ferroelectric crossover [6] or to distinguish between distinct ferroelectric phases coexisting in materials with compostion close to the so-called MPB boundaries[7].

Here we shall present our recent polarized Raman scattering studies of relaxors. In the spirit of Dyproso symposium, we shall go through the basic concepts, challenges and unpublished results.

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Primary author: Dr HLINKA, Jiri (Institute of Physics AS CR)

Presenter: Dr HLINKA, Jiri (Institute of Physics AS CR)

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