PHASE EXCITATIONS IN CHARGE DENSITY WAVE SYSTEMS VERSUS SOFT-MODES AND TLS IN GLASSES

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Temporal changes in the amplitude and phase of the complex order parameter can describe the dynamics of charge density waves (CDW). The low energy degrees of freedom are phase excitations – *phasons*. They are acoustic-like and therefore govern the low-frequency CDW response. However, interaction of CDW with impurities leads to well known pinning characterized by a resonant response at GHz frequencies. Essential physics of CDW involves screening tightly bound with the deformation of CDW. *Pinning and screening* are responsible for the glassy behavior of CDW [1]. The dynamics of the dielectric glass transition strongly resembles the scenario of the freezing in supercooled liquids [2]. The glassy phenomenology is completed with low-energy excitations (LEE), a peak in heat capacity (C_p/T^3), long-time energy relaxation and aging found at low-T [1]. Overall complexity of the manifestation of the CDW glass points to a new class of glass. Relevant degrees of freedom concern the CDW superstructure on characteristic scales of the size of the phase coherence length ($l_\varphi \sim \mu m$). As the lattice distortion associated with the CDW can be thought of as being a "frozen" phonon, we discuss its possible manifestations in relation with the recently proposed phenomenology of boson peak in glasses. It was proposed that the boson peak is related to an incomplete softening of structural modes freezing near the glass transition temperature [3]. Some very well understood aspects of the microscopic picture in CDW systems and the parallels we draw with glass forming systems might be of mutual interest for both fields.

[1] K. Biljaković in Phase Transitions and Relaxations in Systems with Competing Energy Scales (ed. T. Riste and D. Sherington, Kluwer Academic, Dordrecht 1993.) p. 339
[2] D. Starešinić, PhD thesis (Zagreb 2000) and K. Biljaković et al., Synth. Metals **103** (1999) 2616
[3] B. Hehlen et al., Phys. Rev. Lett. **84** (2000) 5355 and B. Hehlen, privat communication