Exploring low-energy landscape of density wave glasses

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Thirty years ago Fukuyama [J. Phys. Soc. Jpn. 45 (1978) 1474] predicted a transition from charge density wave (CDW) state to the charge density glass (CDG) at a finite temperature. In the last decade a wealth of experimental evidence has been collected [1] proving that a glass transition with $T_g \sim T_P/5$ is the new generic feature of DW phase diagram (including SDW). *Pinning and screening* are responsible for the corrugated phase space with numerous minima corresponding to the metastable states, close in energy and separated by finite energy barriers. As the consequence of this landscape a very specific glassy phenomenology has been found at low-T: low-energy excitations (LEE), long-time energy relaxation and aging as well as a peak in heat capacity (C_p/T^3) resembling the boson peak in glasses. Closeness to commensurability reflects in a striking difference in dynamics [2]. New effects have been found in the magnetic field. Apart from a giant magnetocapacitance measured around T_g in two SDW systems [3], LEEs of this new glassy state, soliton-like topological defects, demonstrate also very rich and unexpected properties in a magnetic field at very low temperatures. Equilibrium heat relaxation experiments provide evidence that the ground state of the commensurate SDW system after the application of a sufficient magnetic field is different from the conventional ground state. The experiments are interpreted on the basis of the local model of strong pinning as the deconfinement of soliton-antisoliton pairs triggered by the Zeeman coupling to spin degrees of freedom [4].

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