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Jamming Behavior of Domain Walls in an Antiferromagnetic Film[1]

SUNIL SINHA, University of California San Diego

Over the last few years, attempts have been made to unify many aspects of the freezing behavior of glasses, granular materials, gels, supercooled liquids, etc. into a general conceptual framework of what is called jamming behavior. This occurs when particles reach packing densities high enough that their motions become highly restricted. A general phase diagram has been proposed onto which various materials systems, e.g glasses or granular materials, can be mapped. We will discuss some recent applications of resonant and non-resonant soft X-ray Grazing Incidence Scattering to mesoscopic science, for example the study of magnetic domain wall fluctuations in thin films. For these studies, we use resonant magnetic x-ray scattering with a coherent photon beam and the technique of X-ray Photon Correlation Spectroscopy. find that at the ordering temperature the domains of an antiferromagnetic system, namely Dysprosium metal, behave very much also like a jammed system and their associated fluctuations exhibit behavior which exhibit some of the universal characteristics of jammed systems, such as non-exponential relaxation and Vogel-Fulcher type freezing.

Work done in collaboration with San-Wen Chen (UCSD), Hongyu Guo (UCSD), Keoki Seu (ALS/LBL), Karine Dumesnil (Institute Jean Lamour, Universite de Lorraine, Nancy, France) and Sujoy Roy (ALS/LBL).

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