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Self-assembly of functionalized fullerenes on strained metallic interfaces. BOGDAN DIACONESCU, MIKAEL JAZDZYK, GLEN MILLER, KARSTEN POHL, University of New Hampshire — The process of growing ordered arrays of molecules or nanometer sized clusters with tailorable properties on the dislocation networks of strained metallic thin films requires a detailed understanding of the nucleation processes and film-molecule and intermolecular interactions. We compare two different self-assembly mechanisms of functionalized fullerenes on strained metallic films of Ag on Ru(0001). We found that by controlling the molecular coverage and/or the strain in the thin film, various interactions can dominate the self-assembly process, thus resulting in a richness of structures with controllable properties. At low molecular coverage on 1 monolayer Ag films on Ru(0001), ordered triangular arrays of clusters, 4.9 nm apart, with a tunable number of molecules can be grown. This process is driven by strain relaxation in the metal film, as confirmed by 2D Frenkel-Kontorova models, and was found to be a general one working for various functionalized molecules. At higher molecular coverage and different Ag film thickness, the intermolecular interaction becomes dominant and the symmetry and unit cell size of the self-assembled monolayer are a consequence of the molecular structure and functionality. Both these processes are generally applicable to many functionalized C60 molecules thus opening avenues towards complex self-assembled structures based on lock and key type approach.

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