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Effect of localized mechanical vibration assisted self-assembly of particles on inherent defects. SAYANTAN DAS, Texas A&M-SA — Thin films on surfaces formed of microparticles and nanoparticles is of huge interest for its applicability in various industries. However, bottom up technology like directed self-assembly to create thin films of particles suffer from inherent defects that occur with unpredictable misaligned grain boundaries and point defects. Limiting the usability in applications requiring precision. We demonstrate the effect of using localized mechanical vibration during directed self-assembly process on reducing the inherent defects in particle thin films. Initial studies include polystyrene nanoparticles of diameter of 600 nm and resin microparticles of diameter 0.86 mm. Controlled and localized mechanical vibration were obtained via several cost efficient piezo ceramic elements placed strategically underneath the substrate / surface during the deposition. The frequency of vibration varied from 0-200Hz with phase difference between the vibrating plates ranged from 0 to 2pi. Over 90% reduction in the defects, with larger crystal domains are realized in comparison to control for both micro and nanoparticles. The phased vibration of plates underneath allowed particles to coerce together rapidly. And, the frequency of vibration within 50-100Hz and 5-50Hz, were found optimal for reducing the defects of the films from Nano-particles and microparticles, respectively. Further, numerical investigation was performed using Langevin equation for our system of particle and the results correlated with the experimental findings. **Keywords** defects; thin films; mechanical vibration; self-assembly; particles; nanoparticles; microparticles; numerical investigation; industry; scalable;

Sayantan Das
Texas A&M-SA

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