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Optical diffraction of binary-nanoparticle film prepared by convective deposition with vibration assistance

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Self-assembly nanoparticle films from convective deposition using assistance of vibrated substrate can show optical diffraction in reflected mode, due to uniform high order surface structure. In this work, we investigated the optical diffraction from binary-nanoparticle films which were coated by two types of nanoparticle with different diameter i.e. 100 and 1000 nm of polystyrene and silicon dioxide nanoparticle, respectively. The mixed suspension was prepared by 7 and 20% of polystyrene and silicon dioxide nanoparticles, respectively. The assembled films from binary nanoparticles were deposited with horizontal vibration frequency of 40-60 Hz and at room temperature. The first and second orders of light reflection from film's surface can be observed by detecting light wavelength from various angles of reflection at each incident angle. The films coated with two sizes of particle had the shift of an diffraction angle. This is due to nanoparticles are assemble among the microparticles then the closed packing is differ from the monosize nanoparticle deposition. The angles of reflection from binary sizes were larger than those of single-size coating.

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