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Multifunctional superhydrophobic coatings for large area applications CONSTANTINE MEGARIDIS, THOMAS SCHUTZIUS, ARINDAM DAS, MANISH TIWARI, University of Illinois at Chicago, ILKER BAYER, University of Illinois at Urbana-Champaign — Formulation of flexible superhydrophobic coatings (water droplet contact angles above 150 deg and roll-off angles below 10 deg) with high durability and electrical conductivity, and their fabrication using scalable techniques is a major challenge. The current work lays their foundation using solution processed polymer nanocomposites. Carefully selected polymer(s) are used to disperse filler particles and the dispersions are applied by spraying process. The filler particle size, surface energy and other functionalities are varied to produce the coatings. Sub-micron poly(tetrafluoroethylene) (PTFE) particles and carbon black or other nanoparticles are jointly used to obtain hierarchical morphology (micro-to-nanoscale roughness) and superhydrophobicity. As examples, firstly, acrylonitrile-co-butadiene rubber based nanocomposites are shown to maintain superhydrophobicity up to 200% linear and for 100 cycles of reversible 0 to 100% uniaxial stretching. Secondly, poly(vinylidene fluoride) and poly(methyl methacrylate) blend based nanocomposites containing carbon nanofibers are demonstrated as superhydrophobic coatings with electrical conductivity up to 300 S/m.

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