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Composite layers for barrier coatings on polymers[1] MARKUS BROCHHAGEN, CHRISTOPH VORKOETTER, MARC BOEKE, JAN BENEDIKT, Ruhr-Universitaet Bochum — Amorphous hydrogenated carbon (a-C:H), amorphous hydrogenated silicon (a-Si:H), and SiO2 thin films are of high interest because they can serve as a gas barrier on polymers. To understand how the coating changes the overall barrier properties of the thin film-polymer system, optical, mechanical, and barrier properties have to be studied. One of the important characteristic of such coatings is their compressive stress, which has beneficial as well as unwanted effects. The stress can cause deformation of the bulk material or de-lamination of the film. The mechanical stability can be improved and it is possible to reduce cracking due to elongation, as the compressive stress can compensate externally applied tensile strain. Stress and mechanical properties of composite layers can be manipulated directly by embedding nanoparticles in an amorphous matrix film. Therefore nanoparticles and amorphous layers are investigated before they can be assembled in a composite layer. Growth rates as well as optical and mechanical properties are explored in this work. An inductively coupled plasma source was used for all amorphous layers and the silicon nanoparticles with diameter around 5 nm were produced in a capacitively coupled plasma reactor.

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