Spotlight

POLYMAT

Novel Approaches to 2D and Porous Polymers

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P22 Acrylate based core – shell microspheres

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Polymeric microspheres with a core – shell structure, in contrast to microcapsules, are by definition small spheres which have no distinct outer layer or membrane and are therefore susceptible for diffusion phenomena[1]. This leads to a wide variety of fields of application, such as in the food industry or in the medical field as drug delivery system[2-4]. When the core of such a sphere is a comprised of a volatile substance, the sphere becomes expandable upon reaching the shells glass transition temperature and the core substances boiling point. This has been used in industry since the 1970s for different purposes such as coating agents, in adhesive applications or thermal insulation enhancement[5].

This work is focused on the synthesis of microspheres with a core-shell structure, whereas the core is an inert carbohydrate and the shell is acrylate based. The reactions are carried out as oil in water (OIW) suspensions and as free radical polymerisations. Several different monomers (acrylonitrile, methyl methacrylate, acrylic acid, dipropylene glycol diacrylat and vinyl acetate) and initiators (AIBN and DLPO) are used. Through the variation of the monomer ratios, initiator variation and the OIW ratio, different shell composition can be observed. The characterization conducted with differential scanning calorimeter reveals as expected different glass transition temperatures and melting points for the shell. Scanning electron microscopy is used to characterize the shape and size of the microspheres.

References

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P23 Polymer hybrid composite thin-films with tailored hydrophobic properties

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This paper presents a simple and novel strategy to prepare hydrophobic composite coatings with unique micro/nano hierarchical surface roughness. The coatings were applied in a layer-by-layer configuration, with the hybrid polymeric matrix first, followed by iron oxide nanoparticle dispersion. Chitosan bearing surface vinyl groups, subsequently cross-linked with ethylene glycol dimethacrylate using thermal initiation was tested as a polymeric matrix. The magnetite nanoparticles, capable of self-assembling during the curing stage were prepared by mild oxidation of ferrous ions in alkaline solution, followed by amination with (3-aminopropyl) triethoxysilane. The third film component, pre-hydrolyzed/precondensed sol–gel solution of hexadecyltrimethoxy silane, was incorporated both into the matrix and the nanoparticle suspension, in order to promote the interfacial adhesion and to decrease the surface tension of the coatings. Hybrid nanoparticle-polymer films prepared by spraying were deposited on glass slides and cured by heating. The effects of the matrix composition, the nanoparticles concentration and the polymerization regime of the base layer were studied in order to yield coatings with high wetting angle and good adherence to the substrate in a reproducible manner (Figure 1). The morphologies, surface microstructure, wettability performance and adhesion to substrate of the hybrid coatings were systematically investigated by scanning electron microscopy (SEM), water contact angle (WCA) measurements and scratch tests. The resulting coatings exhibited excellent hydrophobicity and wetting stability driven by the formation of hierarchical roughness. The fabricated environmental friendly hydrophobic surfaces with excellent water-repellant properties will be promising for practical applications.

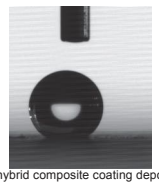

Figure 1. Water drop sitting on hybrid composite coating deposited by the optimum procedure (drop volume: 20μl, average wetting angle: 148°)

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