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Engineering of new proteinoids and proteinoid nanoparticles of narrow size distribution for anti-fog applications

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The "fog phenomenon" describes the formation of tiny droplets of water on different surfaces. In day-to-day life, fog affects the light transmission and damages the visibility of different surfaces, such as plastic packaging, lenses, mirrors and windshields. In this study, a new thin coating onto polypropylene films, made of proteinoids and proteinoid nanoparticles for fog prevention presented. The proteinoids and proteinoid nanoparticles were synthesize by thermal step-growth polymerization of amino acids and therefore are non-toxic, and biodegradable and biocompatible. The anti-fogging ability of proteinoids and proteinoid nanoparticles was discussed in terms of wettability, surface chemistry and morphology, which were measured by contact angle and atomic force microscopy. The efficiency of the anti-fog coatings was also tested by hot and cold fog tests to examine the optical properties of the films under fog formation conditions. The obtained results revealed that the proteinoids and proteinoid nanoparticle coatings perform as a wetting enhancer, mainly due to the low water contact angle (7-40°), that can be attributed to the hydrophilic residues of the proteinoid. Furthermore, proteinoids and proteinoid nanoparticles improved the film roughness by smoothing the surface of films (0.7-1.5 nm). In fog tests, uncoated PP film display many small water drops on the surface that damaged the transparency of the film. In contrast, PP films coated with proteinoids or proteinoid nanoparticles formed a clear continuous thin layer of water on the surface. Additionally, the coating did not affect the clarity and haze of the films. Therefore, the coated films may be utilized in many applications, such as food packaging, agriculture and esthetic nylon wraps.

Biography

Elisheva Sasson is a PhD Candidate from the Institute of Nanotechnology and Advanced Materials in the Department of Chemistry at the Bar-Ilan University. Her research deals with the Design of Coatings on Plastic Films by Proteinoisd and Proteinoid Nanoparticles for Anti-Fog Applications. This work is carried out under the supervision of Professor Shlomo Margel.

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