Antimicrobial films containing microparticles for the enhancement of long term sustained release

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Coated packagings with thin films containing antimicrobial agents are an alternative technology to ensure the protection of products against microbial contaminations. Indeed, they allow lowering the antimicrobial concentration in the bulk of the product while meeting the safety requirements and the growing consumer demand for low preservative concentrations. Microencapsulation is a suitable way for controlling active agent release and providing a long term activity. This work aims at combining both technical solutions with coatings containing antimicrobial microparticles for the achievement of long term sustained release. Polyethylene surfaces were functionalized with microparticles of poly(methyl methacrylate) (PMMA) loaded with phenylethyl alcohol (PEA) as antimicrobial agent by the dip coating process using a polyurethane binder. The release of PEA into water from coated polyethylene surfaces and from PMMA microparticles was investigated to assess the sustained release and its mechanisms. Films with various thicknesses of 400-1000 µm containing antimicrobial microparticles demonstrated unusual long term release longer than 3 months. The diffusion of the antimicrobial agent through PMMA was the rate limiting step of the sustained release. PEA release increased as the contact area of the protruding microparticles with the external medium increased and the thickness of the film decreased. Such antimicrobial agents encapsulated inside thin coatings are promising with regards to antimicrobial preservation of products along their full shelf-life.

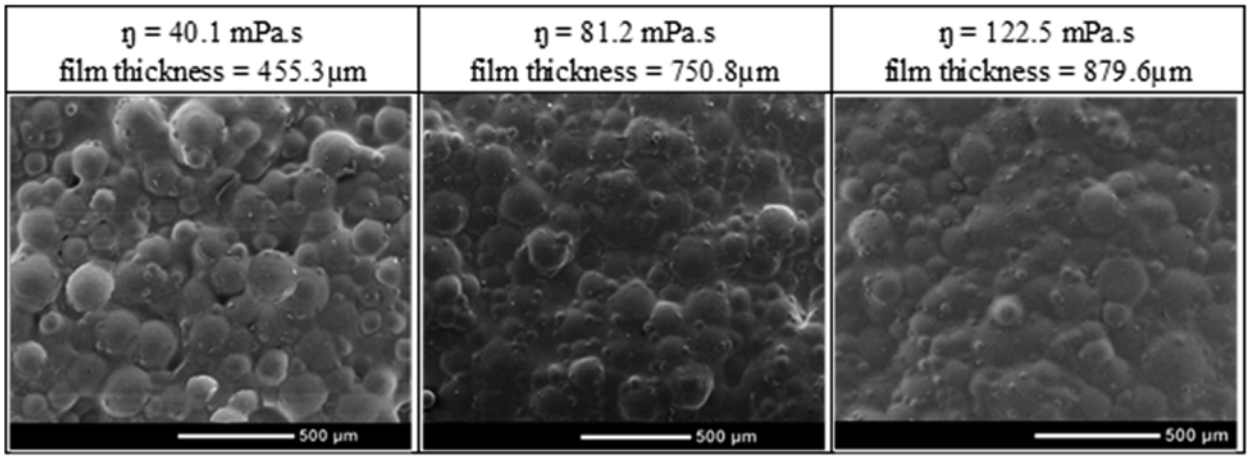

Figure 1 Various morphologies polymer microspheres deposited onto a polyethylene surface.

[1] J. Bile, M.-A. Bolzinger, J.-P. Valour, H. Fessi and Y. Chevalier, *Drug Dev. Ind. Pharm.,* 2016, **42**, 818.