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Synthesis of novel autoreactive and ecological monocomponent adhesives for the shoe industry

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Microencapsulation is a process in which active substances are enclosing inside an extremely small capsule. The wide applications of microcapsules in many fields have attracted increasing research on the synthesis as well as functionalization of different types of capsules. Besides the importance of microcapsules for controlled chemical release and uptake in many industrial applications, these are often difficult to produce with the desired combination of high mechanical strength and high shell permeability. We report on experimental studies for the synthesis of narrow size distribution polyurethane/polyurea shell microcapsules containing isocyanate, used as a crosslinker for adhesive formulations. The microcapsules were produced, in a continuous mode, by a system involving a microfluidic device, which originates a monodisperse oil-in-water emulsion, followed by interfacial polymerization at the emulsion droplets surface. The resulting microcapsules are intended to be added to an adhesive base (OH prepolymer), leading to an autoreactive and ecological monocomponent adhesive. The proposed technique has advantages of being readily controlled, cost-effective and easy to operate. In addition, microfluidics can control the process of encapsulation by varying flow parameters and/or using a proper geometry of microfluidic channels. By microencapsulating the reactive agent, the product is safer for handling by the industry operators, and the activation mechanism can be controlled more precisely (enabling higher flexibility of application /use case scenarios). The advances made of the current study can be an important contribution in the innovation and development of new sustainable/green methods and products that can, in the future, compete in the monocomponent adhesives market.

Biography

Mariana Costa has a Master's Degree in Chemical Engineering and she is currently working in Polytechnic Institute of Cavado and Ave. The project that she is involved is about the microencapsulation field where the goal is to produce a microfluidic device to encapsulate isocyanate.

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