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MS-6-P-3217 HRTEM Studies of Micro and Nanocapsules of Self-Healing Polymeric Materials

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Microencapsulation is a widely used technique to prepare micro and nanocapsules containing active materials. They can be used for many applications such as drug deliver, functional textiles or self-healing materials. All these applications are based in the same principle: the capsule retains the active agent until some stimuli triggers the release of the stored material.

In order to obtain a full control of the releasing process, it is important to fabricate capsules with optimal wall thickness and mechanical properties. The wall thickness determines the easiness of rupture, and therefore, the efficiency in the active agent release. The mechanical properties and the relation between the capsules and its surroundings affect the propagation of the product liberation.

In this work, we have focus on the structural characterization of different micro and nanocapsules with self-healing applications. All the analyzed capsules are based on polymeric materials with different encapsulated agents.

Characterization has been carried out in a HRSEM Merlin from Zeiss equipped with an INCA EDS detector from Oxford Instruments. The samples have been embedded in an EPON matrix and sectioned with a Leica EM UC7 ultramicrotome using a diamond knife. Section thickness has kept below 150 nm to reduce the charging during the SEM observations.

Combining the images acquired with the in-lens secondary electron detector and the energy selective backscattered detector (ESB), we can easily visualize the wall thickness of the polymeric microcapsules. With low voltage EDS studies we can also detect the differences in the carbon and nitrogen amounts, related with the compositional change between the polymeric capsule and the resin matrix.