

DEVELOPMENT OF PERFUME MICROCAPSULES WITH TRIGGERED RELEASE BY MECHANICAL FORCES

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Microcapsules have found applications or have potential applications in a wide range of industrial sectors. They can have many functions, including stabilization of active ingredients and/or realization of their controlled release. Microcapsules for such applications should have desirable structure and properties, including size, shell thickness, permeability, mechanical strength and surface composition, which may be achieved using appropriate formulation and processing conditions.

Different types of microcapsules ranging from one micron to hundreds of microns in size have been prepared for various applications, such as for making pressure-sensitive materials, carriers of drugs, cells, enzyme and active ingredients used in detergents and human care products. A unique technique called micromanipulation has been applied to determine the mechanical properties of these microcapsules. This technique is based on compression of single micro-particles between two flat surfaces and simultaneous measurement of the force applied to them. From direct micromanipulation measurements, the force required to cause a given deformation of single microcapsules, diameter, visco-elastic-plastic behaviour, rupture force and deformation at rupture can be obtained. Numerical modelling of the force versus deformation data with appropriate constitutive equations of the shell materials based on finite element analysis can be used to determine their intrinsic property parameters, such as Young's modulus, yield stress, plastic modulus, and stress/strain at rupture. The mechanical properties of microcapsules with a shell of melamine formaldehyde containing a core of perfume have been extensively investigated, which combined with the data of their chemical composition, structure, leakage, and adhesion on fabric surfaces have been used to optimise their formulation and processing conditions, leading to commercialization of perfume microcapsules in detergents. The details of these studies will be presented.