Release studies of essential oil of *Thymus vulgaris* L. from PLA microcapsules

Isabel M. Martins[a]*, Sofia N. Rodrigues[a], Maria F. Barreiro[b], Alírio. E. Rodrigues[a]

[a] *LSRE - Laboratory of Separation and Reaction Engineering, Department of Chemical Engineering, Faculty of Engineering of University of Porto, Rua Dr Roberto Frias, 4200-465 Porto, Portugal*
**isa@fe.up.pt*
[b] *LSRE - Laboratory of Separation and Reaction Engineering, Polytechnic Institute of Bragança, Campus Santa Apolónia Ap 1134, 5301-857 Bragança, Portugal*

The incorporation of essential oils, perfumes, deodorants and other active agents in microcapsules with the purpose of controlled release over a certain period of time is being a topic of considerable research in recent years [1-2]. The controlled release systems are used to deliver compounds such us drugs, pesticides, fragrances or flavours at prescribed rates, together with improved efficacy, safety and convenience [3]. Nowadays, core-shell microcapsules have been investigated extensively for utilization in ~~a~~ controlled release systems, especially in drug delivery, where the polymeric wall is a permeable element with porosity that can determine the release behaviour of core materials [4].

According to Del Valle et al. [5] diffusion of active agents occurs when, for example a drug or essential oil, passes through the polymeric membrane and/or matrix that forms the controlled release device. There are different classifications for primarily diffusion controlled active agent delivery systems: (a) reservoir system and (b) monolithic systems [6]. However, the release of the active agent from delivery systems can be classified based on other mechanisms, such as, erosion, extraction and burst [7].

A large number of diffusion models have been proposed in the literature to describe the release of active agent from microcapsules. Analysis and comparison of the diffusion mechanism in microcapsules with several geometries and made of different materials can provide fundamental information for understanding the mass transfer behaviour in such systems.

The aim of this work is to study the release of essential oil of *Thymus vulgaris* L. (thyme oil) during the first days of release and develop a general diffusion model for predicting mass transport phenomena in biodegradable polymer microcapsules prepared by a coacervation technique. The release of this essential oil was investigated for microcapsules in solution by comparing calculated and experimental diffusion profiles of oil across de polymer membrane. Control of size and wall thickness of microcapsules and encapsulation efficiency were also studied.

The process to encapsulate thyme oil using polylactide (PLA) as the wall material was the one described in previous papers by Martins et al [8-9]. Tergitol™ 15-S-9 was the nonionic surfactant used to stabilize the o/w emulsion.

PLA microcapsules can be described as spheres with a single-wall layer comprising inner (r_c) and outer radius (r_p) (r_c-< r_p), which are assumed unchanged over the time. A schematic representation is presented on Figure 1. This assumption does not consider possible volume changes due to polymer degradation or swelling effects in the capsule.

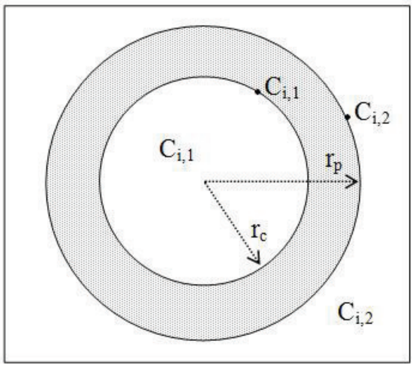

Figure 1. Schematic representation of a microencapsulated particle.

The results show that the release of thymol (the main component of thyme oil) is faster in the first hour keeping almost constant in next days. Moreover, it was observed that the release of the polar compounds of thyme oil is faster than the apolar ones.

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