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Studies about the viability of fragrance encapsulation on sodium and organophilic clay minerals

Yesli Alarcón[1], Mariana Alves[1], Natália Perez[2], Ricardo D. Ricci[2], and Vera R. L. Constantino[1]

[1]Department of Fundamental Chemistry, Institute of Chemistry, University of São Paulo, SP (SP), Brazil
2 Buntech Tecnologia em Insumos Ltda., Indaiatuba (SP), Brazil
E-mail: yalarconm@usp.br

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Personal care products conceived for beautification, cleaning, and personal hygiene include surfactants, moisturizing agents, coloring agents, and fragrances among many other ingredients. A strategy to add value to a product that has a fragrance consists of encapsulating volatile molecules in materials [1]. Clay mineral surfaces have multiple active sites for interactions with organic species, such as the siloxane surface and silanol and aluminol groups on the edges [2]. This work aimed to investigate encapsulation based on the adsorption of a commercial fragrance on montmorillonite clay mineral in the sodium (hydrophilic) and organophilic (hydrophobic) forms. The encapsulation process consisted of a mechanical mixing of the clays with the ethanol-based fragrance sample. The characterization studies comprised thermogravimetric analysis (TGA), X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), and headspace-gas chromatography (HS-GC). Organophilic clay presented a greater capacity for fragrance adsorption than sodium form, but both kept it for temperature values as high as 400°C, according to TGA data. The interaction of the fragrance components with the clays seemed to include not only the external basal and edge surfaces but also the interlayer region because the interplanar distance increased from 1.26 to 1.42 and from 1.29 to 1.39 nm for the organophilic and sodium montmorillonite respectively. The HS-CG analysis demonstrated the adsorption of compounds such as 2-tert-butylcyclohexyl acetate, 3,7-dimethyloctan-3-ol, diphenyl ether, and benzyl acetate by both clays up to the analyzed temperature of 70°C. New peaks were not observed in the HS-CG data of desorbed volatiles from the clays compared to the fragrance analysis, indicating that the inorganic matrices did not decompose the fragrance species. On the other hand, the limonene peak was not observed, suggesting that this molecule interacts weakly even with the organoclay. The recorded data indicated the viability of clay minerals as matrices for the adsorption of an ethanol-based fragrance.

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