Synthesis and characterization of taylor-made organo-clays for biotechnological applications

L. Sciascia[1], I. Calabrese[1], M. Merli[1], A. Pavese[1], M. L. Turco Liveri[1]

[1]*University of Palermo, Dipartimento di Scienze della Terra e del Mare, Palermo, Italy*

The present study was aimed at the preparation and characterization of new tailor made hybrid materials, whose peculiar hosting capability towards different kind of molecules could be further exploited in several biotechnical application as well as oral drug administration or waste water remediation.
Kinetic and equilibrium studies on the Tween 20 uptake ability by K10-montmorillonite (MMT) have been carried out on varying some internal parameters, namely, pH, bio-surfactant concentration and Tween20/MMT ratio. The variation of these parameters allowed us to establish the role played by the hydrophilic/hydrophobic interactions in governing the adsorption process of the bio-surfactant onto the clay minerals.
The gathered kinetic data have been quantitatively analyzed by means of robust approach both for the non-linear regression and the subsequent residuals analysis in order to significantly improve the results in terms of precision and accuracy.
Classical and more complex models reported in the literature have been used.
The adsorption mechanism has been elucidated on the base of the complementary equilibrium and kinetic studies, then, corroborated by the useful information provided by the FT-IR and XRD characterization of the obtained composite materials.
The Tween20 adsorption onto MMT, at pH 1.0, takes place accordingly to two parallel reactions involving the neutral and the cationic form of the surfactant, which interact with two non- energetically equivalent binding sites of the clay surfaces, i.e. the interlayer region and the faces of the lamella.