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Adsorption of pharmaceuticals onto clay minerals and their organoclay derivatives

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Pharmaceutical compounds (PhACs) are among the most concentrated and frequently detected organic micropollutants in both waste and natural waters, and are recognized to have significant toxic actions on numerous ecosystems. The understanding of both the dynamics of these compounds and their association with mineral phases in the environment is of first importance to assess their pollution in water resources. Among the mineral phases in suspension, clay minerals show reactive surfaces, which are frequently associated with PhACs. These adsorbents and their chemically modified organoclay derivatives with the use of surfactants show impressive adsorption properties for numerous organic pollutants and PhACs.

In this present contribution, novel organoclays were synthesized by using alkylpoly (ethylene oxide) nonionic surfactants, characterized by self-assembled phases (lamellar, cubic, hexagonal) [1-3]. The successful intercalation of the nonionic surfactants within the internal clay mineral structure enlarges its interlayer space and points out the close relationship between the surfactant state in aqueous solution and its aggregates on the mineral surface. Moreover, the adsorption data obtained by a set of complementary techniques (adsorption isotherms, X-ray diffraction, small angle X-ray scattering, infrared spectroscopy, solid state nuclear magnetic resonance), reveal that, unlike conventional organoclays prepared by cationic surfactants or raw clay mineral, composite layered material made of nonionic surfactant represent the most polyvalent material for the adsorption of a wide range of PhACs showing different chemical nature [4-5].

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