
Surface Condensation of Organophosphate Esters on Smectites

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Abstract: Parathion and methyl parathion adsorbed at high loads on clays and similar surfaces exhibited properties of a bulk phase, such as a well-defined solubility and a characteristic X-ray powder diffraction (XRD) pattern, different from those of the free substances. The aqueous solubility of parathion condensed at these surfaces was as low as 1.2 µg/ml as compared to 14 µg/ml for free parathion. The BET isotherm described the behavior of the investigated surface condensates even though these condensates were different from the multilayer adsorption for which the BET isotherm was originally developed. The XRD patterns of parathion and methyl parathion adsorbed on Na-bentonite exhibited reflections which were shifted towards higher angles as compared with the XRD patterns of the free compounds. This is in agreement with the lower solubility of the surface condensates. The properties of these condensates were easily controlled by the choice of adsorbent as well as by the choice of conditions under which they were prepared. The existence of such surface-condensed phases and the manipulation of their properties can be utilized for the slow-release formulation of organophosphate esters which is important, for example, in pesticides application.

Key Words: Adsorption • Organophosphate ester • Parathion • Pesticide • Smectite • Solubility • X-ray powder diffraction

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