
Adsorption and Catalytic Decomposition of 4-Nitrobenzenesulphonylmethylcarbamate by Smectite

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Abstract: Adsorption and catalytic decomposition of 4-nitrobenzenesulphonylmethylcarbamate (herbicide Nisulam) on Upton, Wyoming, bentonite saturated with different cations was studied using thin-layer chromatography and infrared spectroscopy. Nisulam is adsorbed at room temperature by coordination through the NO₂ group to the exchange cation regardless of the cation's nature. On moderate heating (75° – 90° C) this molecule decomposes to 4-nitrobenzenesulphonamide whereas a similar compound (herbicide Asulam) containing the NH₂ functional group instead of NO₂ is adsorbed by protonation at room temperature and decomposes into different products. For cations having a high polarizing power, a coordination bond between the Asulam molecule's C=O group and the exchange cation is established, and the molecule decomposes to sulphanilic and carbamic acid. In contrast, for cations having a low polarizing power there is no coordination, and the molecule decomposes mainly into sulphanilamide. Nisulam's coordination to the exchange cation through the NO₂ group instead of C=O is ascribed to inductive and conjugation effects, typical of the nitro group.

Key Words: Adsorption • Asulam • Bentonite • Decomposition • Herbicide • Nisulam

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