
Adsorption Mechanisms of Imazamethabenz-Methyl on Homoionic Montmorillonite

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Abstract: The adsorption of the herbicide imazamethabenz-methyl, a mixture of the two isomers methyl (\pm)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-4-methylbenzoate (*para* isomer) and methyl (\pm)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-5-methylbenzoate (*meta* isomer), from water onto Al³⁺-, Fe³⁺-, Ca²⁺-, K⁺- and Na⁺-montmorillonite was studied by analytical (HPLC) methods. The adsorption from an organic solvent was also investigated by spectroscopic (IR) and X-ray diffraction measurements. It was observed that, depending on the acidic properties of the exchangeable cations, two different mechanisms may take place. The first one, acting on Fe³⁺- and Al³⁺-clays, involves the protonation of the more basic nitrogen atom of imidazolinone ring of the herbicide because of a proton transfer from the acidic metal-bound water, followed by adsorption on the clay surfaces. In this case, the clay surfaces have greater affinity for the *meta* than the *para* isomer, due to the extra-stabilization of the *meta* protonated form by resonance. The second mechanism, taking place on Ca²⁺-, K⁺- and Na⁺-clays, is hydrogen-bond formation between the ester carbonyl group of the herbicide and hydration water metal ions and is not affected by the structure of the isomers.

Key Words: Adsorption • Hydrolysis • Imazamethabenz-methyl • Infrared spectroscopy • Interlayer cations • Montmorillonite • Pesticides

Clays and Clay Minerals; June 1995 v. 43; no. 3; p. 346-352; DOI: [10.1346/CCMN.1995.0430309](https://doi.org/10.1346/CCMN.1995.0430309)

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