

Sorption of the herbicide linuron by Layered Double Hydroxide

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The increase in the levels of pesticide residues in soils and ground waters is a current environmental problem. In order to compensate the losses caused by transport and degradation processes, pesticides are applied to agricultural soils in amounts which greatly exceed those required for control of the target organisms, and the excessive quantities added increase the environmental impact, particularly problems related to drinking water quality. So there are many efforts in development of new materials which could be used in water decontamination.

Layered double hydroxides (LDHs), also known as hydrotalcite (HT)-like compounds, have recently been studied as potential sorbents of pesticides to prevent and remediate water contamination. LDHs are layered materials with a general formula $[M_x^{II}M_x^{III}(OH)_2]^{x+}[X_{x/m}^{m-} \cdot nH_2O]^{x-}$, where $M^{II} = Mg^{2+}$, Mn^{2+} , etc; $M^{III} = Al^{3+}$, Fe^{3+} , etc; and $X^{m-} = CO_3^{2-}$, Cl^- , NO_3^- , etc. The intercalation of organic anions in LDHs changes the nature of the interlayer space from hydrophilic to hydrophobic, thus allowing the sorption of nonionic or low-polarity molecules on these materials (Bruna et al., 2006)

The objective of this work was to investigate the capability of HT (Mg-Al-CO₃) and organo-HTs (HT treated with dodecylsulfate, DDS, anions) on the uptake of the herbicide linuron from aqueous solutions, at different conditions of pH, contact time, initial concentration of the pesticide, sonication treatment, and amount of DDS in the organo-HTs.

The treatment of HT with DDS anions led to a great increase in the sorption of linuron. Sorption by OHT was instantaneous and linear, with little effect of pH and sonication treatment. The increase in the amount of DDS anions in the organo-HTs (100% vs 50%) did not greatly increase the sorption of linuron, probably due to steric hindrance to herbicide sorption at high organic anion loading.