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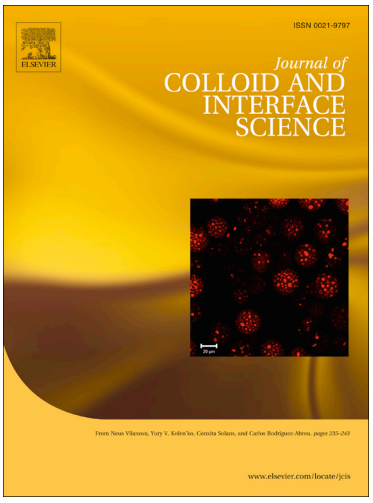

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Enhanced biodegradation of atrazine by bacteria encapsulated in organically modified silica gels

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Abstract

Biodegradation by cells encapsulated in silica gel is an economical and environmentally friendly method for the removal of toxic chemicals from the environment. In this work, recombinant *E. coli* expressing atrazine chlorohydrolase (AtzA) were encapsulated in organically modified silica (ORMOSIL) gels composed of TEOS, silica nanoparticles (SNPs), and either phenyltriethoxysilane (PTES) or methyltriethoxysilane (MTES). ORMOSIL gels adsorbed much higher amounts of atrazine than the hydrophilic TEOS gels. The highest amount of atrazine adsorbed by ORMOSIL gels was 48.91×10^{-3} μmol/ml gel, compared to 8.71×10^{-3} μmol/ml gel by the hydrophilic TEOS gels. Atrazine biodegradation rates were also higher in ORMOSIL gels than the TEOS gels, mainly due to co-localization of the hydrophobic substrate at high concentrations in close proximity of the encapsulated bacteria. A direct correlation between atrazine adsorption and biodegradation was observed unless biodegradation