



## Influence of adsorbed polymers on the adhesion of particles on mineral surfaces

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EFFECT OF MINERAL - ORGANIC - MICROORGANISM INTERACTIONS ON SOIL  
AND FRESHWATER ENVIRONMENTS

INCIDENCE DES INTERACTIONS MINÉRAUX-COMPOSÉS ORGANIQUES-MICROORGANISMES  
SUR LA QUALITÉ DES SOLS ET DES EAUX

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ABSTRACTS

RÉSUMÉS

## INFLUENCE OF ADSORBED POLYMERS ON THE ADHESION OF PARTICLES ON MINERAL SURFACES

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Numerous microorganisms as bacteria or fungi are able to transform xenobiotic organic compounds in liquid media. Their ability is unfortunately reduced even totally inhibited in soils, due to the bad accessibility of the microorganismes to the pollutants. Adsorption of the pollutants onto the soil's constituents contributes to limit their degradation. But, the aggregation of microorganismes and their adhesion on mineral surfaces can also provide the clogging of the porous medium and then an inhomogeneous distribution of the microflora in soil.

We developed a method to measure the adhesion of particles to a planar surface. When available, this method will allow us to investigate the role of exocellular polymers or biosurfactants on the adhesion of microorganisms on mineral surfaces. This method was firstly validated by using rigid model particles and well characterized polymers. We present here the results of this primary study.

Brownian (silica particles) or non-Brownian (glass beads) were deposited on the inner surface of a glass parallelepipedic cell, and then submitted to increasing laminar flow rates. The adhesive force was related to the hydrodynamic force required to dislodge 50 % of the initially attached beads. The pH and the ionic strength of the electrolyte was fixed.

We found that high molecular weight neutral PEO has little effect on the adhesion of small particles due to the low affinity of the polymer for silica or glass surfaces. On the contrary, PEO greatly enhanced the adhesion of bigger glass beads forced to deposit on the capillary surface because of gravity. The increase was all the more pronounced as the molecular weight of the polymer was high. The effect of high molecular weight cationic copolymers on the adhesion of silica particles was drastic even using polymers of low cationicity rate (5 %), showing the efficiency of electrostatic attractions. When copolymers were adsorbed on both surfaces (particles and plane), the adhesive force exhibited a maximum at intermediate coverage.

Our results show that polymers can dramatically change the adhesion of particles. This polymeric effect depends on the nature, the molecular weight of polymers and eventually on the cationicity rate. But adhesion is also very sensitive to the conformation of adsorbed polymers controlled by the physico chemical environment.