



## **Biological activity in Technosols as a key factor of their structure**

Françoise Watteau, Geneviève Villemin, Adeline Bouchard, Marie-France Monserié, Geoffroy Séré, Christophe Schwartz, and Jean-Louis Morel

Laboratoire Sols et Environnement, Nancy Université, INRA, 2 avenue de la Forêt de Haye, BP 172, F-54505 Vandœuvre-lès-Nancy - (francoise.watteau@ensaia.inpl-nancy.fr)

The studies of the dynamics of organic matters within soils, show that their structural stability depends on the biological activity bound to the degradation of organic products. We wondered what it was for Technosols there.

We then tried to specify the contribution of this biological activity to the structure of three contrasted technosols :

- Technosol 1: a material originated from a former steel industry containing steel and coke residues, which was deposited two years ago in lysimetric plots
- Technosol 2: a constructed soil (30 months) resulting from the combination of paper-mill sludge, thermally treated soil material excavated from a former coking plant site, and green-waste compost
- Technosol 3: 30 years old technosol developed on flotation ponds of a former steel mill with strong metallic pollution, on which grows a forest ecosystem

If these 3 technosols presented initially a similar organic carbon content (around 70 g.kg<sup>-1</sup>), the origin of organic matters was different. A follow-up of the structural stability of these 3 systems, based on techniques of granulometric soil fractionation and morphological/analytical characterization at ultrastructural scale (TEM/EDX), was realized.

Results showed the specific contribution of organic matters to the formation of stable organo-mineral associations, in particular those belonging to (0-50 µm) fraction. They mainly involved organic matter from vegetal origin coming from the spontaneous colonization of these 3 sites, but also from microbial origin corresponding to rhizospheric bacteria producing exopolymers. Organic matters from the compost and cellulosic fibers from the paper-mill sludge also contributed to the formation of organo-mineral associations all the more that compost was also a source of microorganisms. Organic matters were also associated to pollutant metallic elements (Pb, Zn, Mn) initially brought by the materials, then highlighting their possible transfer and questioning about their (bio)availability. HAP also contributed to the aggregation of technogenic constituents in Technosol 1.

The biological activity generated by the presence of exogenous organic matter is thus in short (0-2 years) and mean (30 years) terms, a key factor of the structuration and by there of the pedogenesis of Technosols.