



Characterisation and quantification of black carbon (BC) in forest and cultivated sandy soils. Parallel study on reference chars of the BC ring trial

K. Quénéa (1,2), S. Derenne (1), **C. Largeau** (1), C. Rumpel (2), J-N. Rouzaud (3),
O. Gustafsson (4), C. Carcaillet (5)

(1) LBCOP, ENSCP/CNRS, Paris, France, (2) BiomCO, INRA/CNRS/UPMC, Thiverval-grignon, France, (3) Géologie, ENS Paris, France, (4) Department of Applied Environmental Science, Stockholm University, Sweden, (5) Université de Montpellier, France (claude-largeau@enscp.fr)

We examined the BC fraction in the refractory (i.e. resistant to drastic laboratory hydrolyses) organic macromolecular materials (ROMs) isolated from two sandy soils (“Landes de Gascogne”, France): a pine forest and an adjacent plot cleared 22 years ago and since then continuously used for maize cropping. High resolution transmission electron microscopy (HRTEM) afforded direct evidence for the occurrence of BC in both ROMs and revealed the presence of two types of BC particles: irregularly shaped with randomly orientated basic polyaromatic units (markedly predominant) and small spherical with a highly organised, concentric, “onion-like” microtexture. BC was quantified in the ROMs using chemothermal oxidation (CTO). Direct BC measurement was also performed on the whole soils through hand-picking with binocular lens and weighing. BC, as measured by CTO, only accounts for a very low proportion of the carbon of the ROMs while much higher BC contents (ca. x 300 for both soils) were inferred from the direct method. This conspicuous difference reflects two processes: some BC loss during the stepwise treatment applied for isolating the ROMs from the whole soils and elimination of the less resistant BC forms upon CTO. The implication of the first process was supported by parallel studies on reference BC samples (wood and grass chars) from the “BC ring trial”. The second process was evidenced by HRTEM examination of the BC obtained after chemothermal oxidation of the ROMs showing that the predominant less organised BC form was almost entirely

eliminated by CTO while the “onion-like” form was retained. Comparison of the BC contents obtained, by CTO and hand-picking, for the forest and cultivated samples showed that clearing and cropping for 22 years resulted in substantial elimination (at least 60%) of the BC inherited from the forest soil.

Taken together, the above results illustrate the problems encountered for BC quantification and afford information on the stability of different BC forms upon laboratory oxidation and oxidation under natural conditions.