Zinc isotopic variations in HED meteorites

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The zinc isotopic compositions of 21 HED meteorites were determined by MC-ICP-MS following the technique described in Moynier *et al.* [1-3]. The δ^{66}Zn values for the entire suite of samples ranged from -2.0 ‰ to +2.0 ‰, with a mean value of -0.07 ± 0.37 ‰ (2σ), excluding one anomalous sample (PCA 82502, which has δ^{66}Zn = -7.75 ‰). The mean δ^{66}Zn value for 13 eucrites was +0.13 ± 0.50 ‰; for 4 diogenites, -0.41 ± 0.99 ‰; and for 4 howardites, +0.30 ± 0.49 ‰. Eucrite falls were significantly isotopically heavier (+0.47 ‰) than finds (-0.99 ‰), consistent with previous reports of heavy isotope loss with terrestrial weathering (Luck *et al.* [4]). There was significant Zn isotopic heterogeneity between different chips from the same meteorite, and even within the same small chips. The mean HED fractionation of approximately zero supports a chondritic origin for Vesta (Luck *et al.* [4] report δ^{66}Zn = -1.30 to +0.76 ‰ for ordinary and carbonaceous chondrites). The anomalous eucrite PCA 82502 was significantly isotopically lighter than the others, with a δ^{66}Zn value of -7.75 ‰, the largest Zn fractionation reported in the solar system to date. This meteorite may be a sample of the primitive eucritic crust that was spared from significant mixing, or it may have originated from a distinct parent body.

[1] Moynier *et al* (2006), *GCA* **70**, 6103-6117; [2] Moynier *et al* (2007), *GCA* **71**, 4365-4379; [3] Moynier *et al* (2009), *EPSL* **277**, 482-489; [4] Luck *et al* (2005), *GCA* **69**, 5351-5363.

Nanoscale structure of organic matter could explain soil organic matter recalcitrance

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Previous our studies showed that the modification of the ultra-structure of the cell wall influenced its degradability in soil [1, 2]. In particular according to the more recent literature it seems that microstructure of the cell wall, limits enzyme activity because these latter has a dimension greater that pores composing the topography of the cell wall [3, 4]. In a more recent study on energy crop, we have shown that by modifying the cell wall microstructure by removing hemicelluloses via steam explosion, the cellulose availability for enzymatic action increased, such as confirmed by the higher glucose produced by cellulase enzymes when it was dosed on treated plants. These results were ascribed to the enlargement, such as effectively measured, of the pore spaces between cellulose fibrils. Therefore our results attested that effectively there is a 'steric' protection of the cell wall polymer to the enzyme attack due to the micro-porous structure. Here we provide new data to support our idea, going insight into mechanistic understanding of cell polymer protection. Doing so, we have selected different biomasses (*n*=15) such as plant residues, crop energy plants and lignin-carbohydrates complexes (LCC) isolated after acid hydrolysis (core-fraction). These fraction were incubated in soil for 1 year, i. e. agricultural season,, dosing an amount of 2 g C kg^{-1} soil dry matter. CO_2 evolution was detected by using NaOH trap and data reported as cumulative results. Microporosity surface was, also, detected by using the technique of the gas adsorption utilizing a porosimeter (that allow to measure both micro-porosity surface (MiS) (surface of pores of 0.3-1.5 nm of diameter) and corresponding micro-porosity. Incubation experiment revealed that the recalcitrance, i. e. the natural resistance against microbial and enzymatic deconstruction was associated to the MiS. For example, LCC complexes were less degraded and they were characterized by a highest MiS. On the other hand biomasses characterized by young tissues, such as plant residues were largely degraded in soil and showed low MiS values. The relationship between MiS and degradability was confirmed by the good correlation found between these parameters ($r=-0.85$, $p<0.01$; *n*=15). Therefore the results of this investigation indicated that protection from enzymatic attack by cell wall topography plays a main role in determining biomass degradability and so its turnover in a short term.

[1] Adani *et al.* (2009) *Chemosphere* **76,** 523-528. [2] Papa *et al.* (2010) *Chemosphere* **78,** 1036-1041. [3] Lenting *et al.* (2001) *J. Biotechnol.* **89**, 217-226. [4] Himmel *et al.* (2007) *Science* 315, 804-807.