The relationship between heavy metals and sedimentary organic matter in the Oxford Clay (Jurassic) of the southern UK

[a]Huang P, [a]Marshall J, [b]Stringfellow A, [b]Smallman D, [c]Scotney P

The Oxford Clay is organic rich sediment widely distributed across the southern UK. It has been widely used for brick making and this has led to the many former pits being used as land fill sites. Some of the more modern sites are now specifically excavated for land fill. Although it has excellent retention properties for land fill it occurs above the minor aquifer of the Kellaways Sand. This must not become contaminated. Heavy metals are relatively abundant in the Oxford Clay and the waste water that drains from the land fill sites. It is very important to understand the source of these metals as to their source from either the Oxford Clay or the land fill. It is also important to understand how these metals might interact with the organic matter in the Oxford Clay.

This investigation has determined the distribution of organic matter through a cored section of Oxford Clay from a landfill site. Analyses include TOC%(Total organic carbon contain), visual kerogens in transmitted light and the phytoclast component in reflected light. TOC% enables us to determine the boundary between the Oxford Clay and Kellaways Sand. Changes in quartz size and the percentage of clay and quartz confirm this determination. The organic matter found in rock is mainly phytoclasts (vitrinite and semifusinite), pollen and AOM (amorphous organic matter). Point counts shows that AOM dominates all samples. Heavy metals including V, Cr, Co, Cu, Ni, As, Zn were analyzed to compare with the organic matter data. Phytoclasts have been regarded as particularly important on account of their presumed interaction with metals from groundwater. In addition to organic petrology the distribution of selected heavy metals through parts of the core and within different organic and mineral fractions of single samples has also been investigated. This variation of different metal ions concentration implies a link between TOC% and AOM percentage.

For clarifying the relationship between heavy metals and various factors, iron content,TOC%, AOM%, Clay% and Pyrite% are measured in order to compare with heavy metals abundance. In the Oxford Clay, copper is richer in the AOM, while Arsenic appears richer in pyrite. Cobalt, Nickel and Chromium have higher contents in the AOM than in pyrite. The zinc concentration fluctuates between pyrite and AOM and may be linked with sphalerite occurrence. More samples are being analyzed to confirm the correlation of heavy metals in the Kellayways Sand.

[a] National Oceanography Centre, Southampton Waterfront Campus, European Way, Southampton, United Kingdom.SO14 3ZH (Ph3g09@soton.ac.uk)
[b] School of Civil Engineering and the Environment, University of Southampton, Highfield, Southampton SO17 1BJ, United Kingdom.
[c] Waste Recycling Group Limited, Ground Floor West, 900 Pavilion Drive, Northampton Business Park, Northampton, NN4 7RG, United Kingdom