Biogeochemical influences on the decomposition and dispersion of depleted uranium in the environment

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The UK military employs anti-tank rounds of depleted uranium (DU) alloyed with 0.75 % Ti. The vast majority of DU entering the environment does so as large pieces of DU alloy (generally in the form of partially oxidised fragments) and these can penetrate deep into soils and sediments, and may remain intact for long periods of time.

The environmental fate of DU alloy following corrosion and oxidation is not well understood. In particular, only very limited studies have been undertaken into microbial controls on DU alloy decomposition in conjunction with the associated geochemistry. The microbial community plays a very important role in controlling geochemical processes and this may be especially so for a redox-active element with variable chemistry such as uranium.

We are undertaking a series of studies involving both laboratory model systems ("microcosms") and field samples to gain a predictive understanding of the chemical and microbial processes involved in DU decomposition and transformation. The effects of DU on bacterial and fungal communities are being explored with both culturing and molecular methods. We are specifically investigating the DU decomposition pathways in different terminal electron acceptor regimes, particularly the sequential utilisation of oxygen, nitrate, iron and sulfate by microorganisms.

The dissolved, colloidal and macroparticulate fractions of DU as a function of decomposition time and biogeochemical conditions are being quantified. A range of imaging and analytical techniques is being used to characterise the nano- and macro-particulate DU decomposition products. The early findings from this work will be presented.