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The Stabilisation and Fractionation of Carbon in Manganese Oxides

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Abstract

The sequestration of carbon in sediments results in an overall removal of CO₂ from the atmosphere (Burdige, 2006) and an understanding of both its prevalence and modes of formation is crucial to understand the carbon cycle. Here we present evidence for the first time on the intercalation, stabilisation and fractionation of dissolved organic matter (DOM) as molecularly uncharacterized carbon (MUC) within manganese oxide minerals in modern sediments. The manganese oxide is present as coatings in a clean water treatment works filter bed (Mosswood WTW, Northumberland, UK, Co. Durham, UK, 54°51'N - 53°59'W) and has a Total Organic Carbon of 3.0% (n=6) and Total Inorganic Carbon of 0.5%(n=6). The organic carbon is not extractable using conventional solvents or acids/bases and it can be therefore operationally defined as kerogen (Durand, 1980, Vandenbroucke, 2007). We conclude that the role of manganese oxides in stabilising and fractionating carbon in sediments has been previously overlooked and this is an area where more research is needed in order to help fully understand the preservation mechanism for carbon in sediments.