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Studies on graphene-based materials for the removal of radionuclides from aqueous solution.

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Graphene-based materials (GBMs), such as graphene oxide (GO) have previously been shown to demonstrate exceptional surface sensitivity [1], sorption capacity [2] and selectivity [3] for radionuclides. In addition, it has been found that the selectivity of GO towards certain radionuclides can be further improved by covalent attachment of chelating ligands. Such modifications have been shown to lead to enhanced targeted sorption and removal of long-lived actinides, in particular, U(VI), from aqueous solution [4, 5]. Therefore, ligand-modified GO is believed to be an ideal sorbent material for use in aqueous nuclear waste treatment. In such applications, selective removal of radionuclides could potentially lead to a reduction in the total volume of nuclear waste designated for long-term storage in reprocessing facilities [6].

This work aims to present the recent developments made to modify the surface of GO, which was designed with a high affinity for U(VI). The sorption behaviour of the modified-GO materials was investigated in the form of batch experiments, as a function of pH, sorbent to solution ratio and contact time, with aliquots analysed by inductively coupled plasma mass spectrometry (ICP-MS). Finally, a combination of surface characterisation techniques was performed to assess the suitability of the modified-GO material for waste processing.

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