Microbially mediated transformation of graphene oxide

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Graphene oxides are being researched for a variety of uses, including thin films, for therapeutic purposes, as antibiotics and for hydrogen storage [1-5]. However, there is little information concerning the environmental impact of large scale production. In order to understand how microbes would interact with graphene oxide, bacteria from the genus *Shewanella* were incubated under anaerobic conditoins with graphene oxide as the sole terminal electron acceptor. Results demonstrated that graphene oxide reduction was rapid and comparable to chemical reduction methods. Prior to incubation, only 24% of the graphene oxide carbons are unfunctionalized. After incubation with *Shewanella*, over 95% of the carbon was unfunctionlized, indicating a loss of oxygen. Incubation of bacteria with no carbon source produced no change in the nature of the graphene oxide. The ability of microbes to process graphene oxides may provide a means of mitigating potential issues arising from their introduction into environmental systems. It also provides an opportunity for understanding the way bacteria interact with graphtitic substances.

[1] Avouris *et al*. (2007) *Nature Nanotechnology* **2**, 605–615. [2] Liu *et al*. (2008) *JACS* **130**, 10876–10877. [3] Stoller *et al*. (2008) *Nano Lett* **8**, 3498–3502. [4] Geim (2009) *Science* **324**, 1530–1534. [5] Wang *et al*. (2009) *ACS Nano* **3**, 2995–3000.

Högbomite associated with V-Ti Magnetite bands of Shimoga Schist belt, Western Dharwar Craton, Karnataka, India

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Högbomite a rare exotic mineral is found to be associated with Vanadium-Titaniferous (V-Ti) bearing magnetite (Mt) bands from Shimoga schist belt, Western Dharwar craton, India. We report here the presence of högbomite as a complex oxide of Fe, Mg, Al and Ti with accessory of Zn, V and Sn. The petrographic studies on (V-Ti) bearing (Mt) contain magnetite, martite, ilmenite (Il), spinel, högbomite and chlorite. Högbomite occurs as medium grained euhedral to subhedral crystals up to 20μm as cumulus and intercumulus along the grain boundaries of 'Mt'and 'Il. In the samples studied högbomite is prismatic, irregular and elongated in shape. It is opaque, but exhibit a strong pinkish colour under reflected light with feeble pleochroism. In (Fig.1) högbomite is associated with magnetite and ilmenite and also show the exsolved phases of hematite in ilmenite. The element compositions of högbomite are analysed by Electron Microprobe (EPMA) at NGRI, using an accelarting voltage of 20 KV. The elemental compositions of högbomite in samples range from (magnesio, zinc and ferro) varities. In the samples studied the genesis of högbomite could have been due to its close association with spinel and formed by the substitution of Ti^{+2} for Mg, Fe^{+2} and Fe^{2+} for Al^{3+} under silica undersaturation with the prevalent high oxygen fugacity conditions or perhaps due to the loss of 'Al' in högbomite which would be compensated by oxidation of magnetite, as in most cases högbomite is associated with magnetite and present along the grain boundary. Several models were proposed for the formation of högbomite, however still, the subject is debatable.

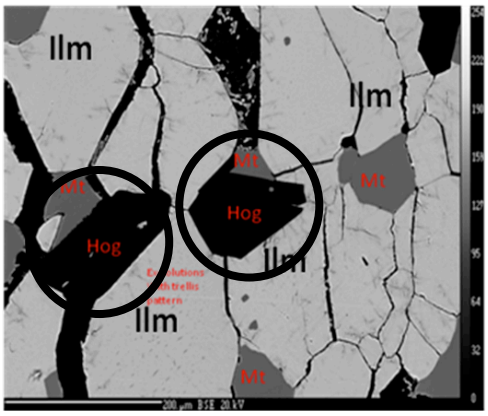

Figure 1: Högbomite (Hog) (in circle) along the grain boundary with Ilmenite (ilm) and Magnetite (Mt)