New data on unexpectedly high arsenic concentrations within a landfill plume in Central Massachusetts, USA

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A contaminant leachate plume, associated with a closed and capped landfill in North Central Massachusetts, USA, contains surprisingly high levels of arsenic which at several locations within the plume can reach and exceed 15,000 ppb of As in groundwater. The landfill waste material was dumped over a layer of peat of variable thickness (up to 4 m thick), originally a marshland that developed over a thick sequence of glacial lake deposits (50 to 100 ft). During the summer of 2010 a comprehensive study of the landfill area included direct-push drilling at 18 separate locations, with sampling at regular 10 ft vertical intervals. The results indicate the regions of elevated arsenic concentrations and more importantly provide a unique opportunity to delineate arsenic pathways in 3D space. The study identified an existence of unexpectedly high arsenic zone in groundwater with strong concentration gradients on each side of the zone. The zone is less than 3.5 m thick, contains As above 10,000 ppb (up to 16,000 ppb), and is positioned beneath the peat layer and above a basal till unit. Although the landfill waste can not be ruled out as potential source, one possibility for the source of As is the peat layer itself which, when covered by the waste material, may have promoted bacterial activity driven by organic carbon transported downward from landfill waste prior to capping, creating a reducing environment and remobilization of arsenic. However, the post-glacial geohydrologic evolution of the area is poorly constrained. Historically, the landfill operated as an open dump for a period of 100 years or more. Hydraulic conditions necessary to move shallow groundwater through waste to depth were eliminated by cap construction in the mid-1990's, and the hydraulic regime following capping continues to evolve.

Geological characteristics and fluid inclusions of Chagangnuoer iron ore deposit in the western Tian Shan Mountain, NW China

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Located along the southwestern margin of the Central Asia Orogenic belt, the Chinese western Tian Shan Mountain is famous for abundance of mineral resources. In recent decade, remarkable advances have been made in the iron ore exploration in the Awulela metallogenic district. Take Chagangnuoer iron ore deposit for example, which is found in the late 1960s with only 6 millions ton reserves. With careful magnetic survey in 1980s and drilling prospecting since 2004, this iron ore has become a large scale one whose reserves are more than 210 million tons. Hosted in the andesite and andesitic volcaniclastic rock of the Lower Carboniferous Dahalajunshan Formation, orebodies are controlled by NW, NWW, NEE strike faults and circular faults. This iron ore is composed of two major orebodies as FeI and FeII. FeI orebody is NE-SW strike, about 2900 meters in length, 63 meters in average thickness, and about 190 million tons reserves with thin copper layer. Wall rock alterations mainly exhibit garnetization, actinolitization, chloritization, epidotization, calcitization and so on. And marble distributes in the bottom of orebody. Ore minerals are consisted of magnetite, pyrite and chalcopyrite while gangue minerals are composed of garnet, actinolite, chlorite, epidote, tremolite, calcite *et al*.

Three kinds of fluid inclusions have been discovered in calcite, liquid-rich inclusion (75%), pure liquid inclusion (20%), and daughter (halite) inclusion (3~5%). Homogenization temperature is 290~410℃ in the calcite paragenesis with garnet, whereas homogenization temperature is 120~230 ℃ in the calcite paragenesis with chlorite and epidote. According to a table describing the relationship between salinity and freezing-point depression [1], NaCl-eq salinity is 10.49~17.87%.

[1] Bodnar RJ (1993) Revised equation and stable for determining the freezing point depression of H_2O-NaCl solutions. *Geochimica et Cosmochimica Acta* **57**, 683-684.