The fate of mercury at a contaminated site

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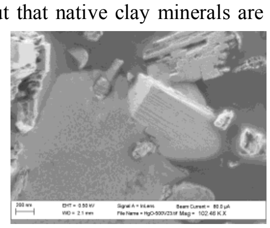
Soils contaminated with mercury present unique challenges for remediation due to the variety of chemical forms in which mercury occurs. Mercury, like many other heavy metals, cannot be degraded in the environment and its remediation must therefore involve either removal or immobilization. The characteristics of the mercury in sediment, i.e., Hg(0) beads with or without coatings of HgO and $Hg(OH)_2$, or oxidized Hg(II) that is attached to sediment minerals, or precipitated Hg as mercury sulfide (HgS), underpins the technologies that can be effective for clean up. When selecting mercury remediation technologies at a given contaminated site it is essential that the form of mercury—especially speciation—is well understood.

During the mercury use era at the Y-12 National Security Complex, Oak Ridge, Tennessee, large quantities of mercury were lost to the subsurface environment[1]. Spilled elemental mercury has undergone complex biogeochemical transformations under both saturated and unsaturated conditions. High-levels of mercury have recently been found in soil collected from a Hg use area (which housed a mercury retort furnace from 1957 until 1962[2]). Hg concentrations, determined by atomic absorption following core collection, sampling and soil digestion, ranged from 0.2 to 19000 ppm. Hg(0) was the dominant form in sediment samples where mercury beads were visually present[3]. Additionally micron-sized Hg(0) beads were also observed. Although the formation process is under investigation, the observed micron-sized beads may have formed in situ due to high vapor pressure and/or disintegrated from the original Hg(0) beads over the last 50 years in the subsurface. New SEM and XRD evidence shows that the coatings of the mercury beads are predominantly HgO, but that native clay minerals are also



present. These results are being incorporated into further laboratory tests focused on evaluating the fate and transport of mercury as well as the development of new remediation strategies.

1. Brooks, S. C., Southworth, G. R., 2011. Environmental Pollution 159, 219-228.

2. King, D. A., 2010. Characterization report for the 8110 area in the Upper East Fork Poplar Creek area at the Oak Ridge Y-12 national security complex, Oak Ridge, Tennessee, DOE/OR/01-2485&D1, Oak Ridge Institute for Science and Education

3. Miller, C., Watson, D., Phillips, D., Lowe, K., Lester, B., Liang, L., 2011. Field and laboratory characterization of mercury contaminated soils: Implication on mercury transformation and remediation, Halifax, Nova Scotia, Canada.