Title:

Effects of pH on Metal Leaching from Activated Carbon Block Filters

Abstract

Activated carbon block filters are commonly used in point-of-use water filtration systems, but limited studies have been done on the potential leaching of metals from these filters, which may pose potential health risks to humans. This study aimed to investigate the effects of pH on metal leaching from activated carbon block filters. Commercially available activated carbon blocks were cut to similar size and weight and exposed to tap water whose pH was changed to between 4 and 9. Inductively coupled plasma optical emission spectroscopy (ICP-OES) was used to measure metal concentrations. The results indicated that metals were leached significantly differently under different pH due to different mechanisms. Manganese was partially precipitated under alkaline conditions under basic pH conditions above 8. Copper may exist as $Cu(OH)_3^-$ and $Cu(OH)_4^{2-}$ in solutions when pH was above 8, which resulted in an increased in copper concentration. Zinc was found to be leached under pH condition of 4 but could be adsorbed by activated carbon again after 50 hours. Additionally, potassium and sodium in the raw material of activated carbon were gradually leached into the solution under all pH conditions and the resulting concentrations were between 5,000 ppm and 10,000 ppm. These results showed that pH is an important factor that may affect the metal leaching from activated carbon block filters, and the health risks associated with leached metals in drinking water should be further investigated.