

Investigations of Pb and Cu isotope signatures to trace contamination sources in the industrial area of Korea

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Many studies have been carried out to identify pollutants in environments, but it is difficult to precisely investigate metal pollution sources by measuring metal concentrations. Recently, the application of metallic stable isotopes has become an effective technique for identifying and tracking anthropogenic sources.

The Pb and Cu isotopes analysis in stream sediments were conducted to identifying the metal pollution sources from industrial area of Korea. Mean of Pb and Cu concentration in stream sediments were 361.1 mg/kg (40.2-2,260 mg/kg) and 1,225 mg/kg (42.8-11,080 mg/kg), respectively. Pb and Cu concentration were highly variable at sampling site. The results of enrichment factor showed that the stream sediments were severely contaminated with Pb and Cu. $^{208}\text{Pb}/^{206}\text{Pb}$ varied from 2.0983 to 2.1990 with average of 2.1331. The relationships between $^{207}\text{Pb}/^{206}\text{Pb}$ and $^{208}\text{Pb}/^{206}\text{Pb}$ ratios showed different regression lines for each stream. But, in the case of E and F streams, the differences between the sites affected by F stream and not affected were clearly distinguished. Pb isotope ratio ($^{208}\text{Pb}/^{206}\text{Pb}$) tend to decrease with increasing Pb concentrations. $\delta^{65}\text{Cu}$ in stream sediments showed a large variation ranging between -0.16 ‰ and 0.64 ‰. The Cu isotopic variation at low concentration is much larger than that at high concentration. The average of $\delta^{65}\text{Cu}$ isotopes from A to E streams were similar (0.08-0.13 ‰). Shingil stream consists of two upstream (E and F) and downstream (G). Two upstreams (E and F) were characterized with residential and industrial areas, respectively. Sediments have the heavier $\delta^{65}\text{Cu}$ value (0.10 ‰) from E stream and the lighter $\delta^{65}\text{Cu}$ value (0.37 ‰) from F stream, respectively. $\delta^{65}\text{Cu}$ value tend to increase toward downstream, indicating that various metal sources could enter into stream systems.

Investigation and analysis of Pb and Cu isotopes in various chemicals and materials of study area is need to study the metal contamination sources, transport pathways, behaviour, and contribution of contaminants.