The isotopic composition of lead in Chinese coals

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Lead (Pb) has four isotopes (204, 206, 207 and 208) in nature. Since ^{206}Pb, ^{207}Pb and ^{208}Pb can be the respective decay daughters of ^{238}U, ^{235}U and ^{232}Th, this makes Pb isotopes an unique "fingerprint". Given limited fractionation during physical, chemical and biological processes, Pb isotopes have been widely used to trace the sources of Pb contamination and its migration pathways, and evalute Pb contributions from different geological end-members.

Coal and its utilization have been considered as a significant source of Pb release into environment. However, Pb isotopes in Chinese coal have not been systematically studied with the exception of a few works. Here, more than 200 coal samples were collected from the major coal-producing areas in China, and their high precision Pb isotopic compositions were measured by Nu Plasma II MC-ICP-MS using the ^{205}Tl/^{203}Tl=2.38865 (NIST SRM 997) to correct for the mass discrimination. The results show that the ^{206}Pb/^{207}Pb ratios in Chinese coal vary from 1.0917 to 1.2780 with a geometric mean of 1.1879±0.0134 (n=201, 1SD). This mean value is very similar to that (1.1895±0.0184) observed in Europe coal and slightly lower than that (1.2059±0.0116) in North America coal, but obviously different from the mean 1.1683±0.0134 summarized by Dfaz-Somoano[1] for Asia coal. Thus, it is difficult to obtain a reasonable estimate of Pb isotopes in coal through observation of a limited number of samples, especially for Chinese coal. The Pb isotope ratios in Chinese coals studied here vary in age. The average ^{206}Pb/^{207}Pb values of Chinese coals formed in Carboniferous, Permian, Triassic, Jurassic and Tertiary Periods were 1.1738±0.0227 (n=45), 1.1915±0.0324 (n=83), 1.2014±0.0234(n=9), 1.1820±0.0181 (n=44) and 1.1787± 0.0459 (n=10), respectively. The spatial distribution of Pb isotope ratios in Chinese coals is characterized by a trend of southern value higher than the northern value. These results will help us to identify the sources and migration pathways of Pb in the environment.

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[1] Dfaz-Somoano et al. (2009) *Environ Sci Technol* 43, 1078-1085.