

$^{40}\text{Ar}/^{39}\text{Ar}$ Phenocryst-Matrix isochron dating on Quaternary volcanic rocks

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A big challenge of K-Ar and $^{40}\text{Ar}/^{39}\text{Ar}$ dating is to obtain precise ages of Quaternary volcanic rocks with low K and high Ca content. To date these rocks, isochron method has been widely used on matrix with phenocryst removed. However, if argon isotope concentrations of matrix are too close, isochron ages may be unreliable. To solve this problem, we have developed a Phenocryst-Matrix isochron method to get more reliable results. This method is based on initial $^{40}\text{Ar}/^{36}\text{Ar}$ values of phenocryst and matrix tested uniform. To determine it, we propose to compare the uniformity of initial $^{36}\text{Ar}/^{38}\text{Ar}$ values of phenocryst and matrix before samples are irradiated by neutron. If the initial $^{36}\text{Ar}/^{38}\text{Ar}$ values are uniform, the initial $^{40}\text{Ar}/^{36}\text{Ar}$ values are supposed to be uniform. Here we dated young volcanic rocks from Lei-Zhou area in Southeastern China, and obtained five isochron ages that range from 0.05Ma to 0.35Ma with relatively large error. Considering these unreliable results and tested uniform initial $^{36}\text{Ar}/^{38}\text{Ar}$ values of phenocryst and matrix, Phenocryst-Matrix isochron method was applied for all the samples of this area (shown in the figure below), yielding an age of 0.18 ± 0.03 Ma, which fits well with stratigraphic time.

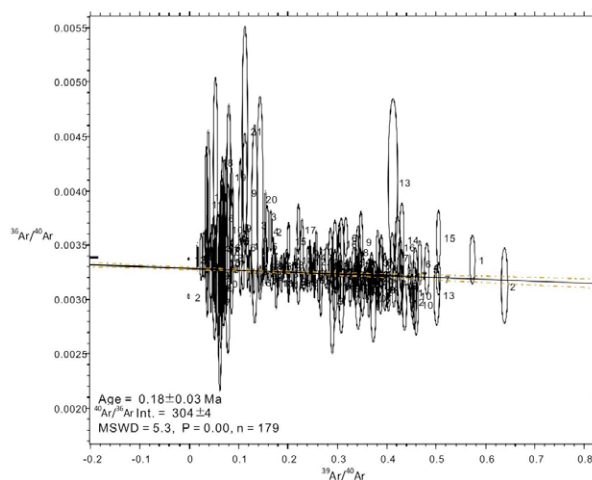


Figure 1: $^{40}\text{Ar}/^{39}\text{Ar}$ Phenocryst-Matrix isochron for all the samples from Lei-Zhou area.

Sulfur isotopic compositions of total suspended particulates (TSP) in Chengdu, Southwest China

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The sulfur isotopic compositions were analyzed to discuss the source and transformation process of sulfur in total suspended particulates (TSP) that collected from a megacity, Chengdu, SW China where atmospheric particulate matters, a major air pollutant, currently affect air quality of this city.

The annual variations of $\delta^{34}\text{S}$ values of TSP from 2005 to 2010 were little and the data were concentrated within 5.3~5.8‰. The seasonal variations of $\delta^{34}\text{S}$ values of TSP were obvious, and the order was winter (6.6‰) > spring (5.2‰) > autumn (5.0‰) > summer (4.5‰) which is similar to the concentrations of sulfate in TSP. The $\delta^{34}\text{S}$ and sulfate content of TSP were higher in winter and spring that probably be associated with high-sulfur coal combustion, and lower in summer and autumn which might be affected by biogenic sulfur which having light $\delta^{34}\text{S}$. Under different weather conditions as foggy, cloudy, sunny and rainy days, the changes of $\delta^{34}\text{S}$ values were not obvious except that higher data in the rainy days, and there is no correlation between the $\delta^{34}\text{S}$ values and sulfate content of TSP. In the rainy days, the gaseous sulfur dioxide having light $\delta^{34}\text{S}$ values dissolved in rain by liquid-phase oxidation reaction, which led to the collected TSP being little affected by gaseous SO_2 and the sulfur in TSP were more from the particulates having heavy $\delta^{34}\text{S}$ values resulted from coal combustion. Consequently, the $\delta^{34}\text{S}$ values of TSP were probably higher in the rainy days.

The mass ratios of $[\text{SO}_4^{2-}]/[\text{NO}_3^-]$ in TSP decreased from 2005 to 2010, which indicated the atmospheric quality in Chengdu would be more affected by vehicle exhaust while the pollution control in coal combustion are stepped up.

This work was supported by the National Natural Science Foundation of China (Grant No. 41173022).

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