NH_4HF_2- assisted digestion of silicate rocks for multi-element analysis by ICP-MS: A new development in open vessel digestion

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Complete digestion is prerequisite to obtain accurate analytical results for geological samples [1,2]. A new digestion technique using NH_4HF_2 in Savillex screw-top Teflon vials has been developed for multi-element analysis, including felsic rocks that contain refractory minerals such as zircon.

NH_4HF_2 has a higher boiling point (239.5 °C) than conventional acids such as HF, HNO_3 and HCl, which allows for an elevated digestion temperature in open vessels, enabling the decomposition of refractory phases. A digestion time of 2–3 hours for 200 mg NH_4HF_2 in a Savillex Teflon vial at 230 °C is sufficient to digest 50 mg of the felsic rock GSP-2, which is ~6 times faster than using conventional closed-vessel acid digestion at 190 °C (high-pressure PTFE digestion bomb). No insoluble fluorides are present in the final sample solution in this method, even when the sample mass is as large as 200 mg. It appears that the low pressure environment inhibits the formation of insoluble fluorides. The ready production of an ultrapure NH_4HF_2 reagent by sub-boiling distillation makes the proposed NH_4HF_2 digestion method suitable for ultratrace-multielement analyses in various geological samples.

The new method combines the advantages of both the open- and closed-vessel digestion methods, providing us with an effective, simple, economical, and comparatively safe dissolution method.

[1] Lamble & Hill (1998) *Analyst* **123,** 103–133. [2] Tanaka *et al*. (2003) *Anal. At. Spectrom* **18,** 1458–1463.

Nd-Sr isotopic evolution of Asian dust: Tectonic And climatic implications

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The eolian deposits archived in the loess and Pacific pelagic sediments provide important information on the late Cenozoic atmospheric circulation and paleo-environmental condition of the source regions. In recent years, Nd-Sr isotope was widely used to trace the source of eolian dust. Systematic investigation on the Nd and Sr isotopes of potential source materials in recent years provides a solid bases to interpret the Nd-Sr isotopic evolution of Asian dust[1]. Here we present new sedimentary records of Asian dust from Chinese Loess Plateau and Northwest Pacific, which may shed new light on regional tectonic and climatic evolution since the late Oligocene.

The Nd isotope of Chinese loess decreases while the Sr isotope increases progressively during 22-1.2Ma. This record is based a very narrow grain size range (28-45 μm) of silicate fraction so that potential influence of weathering and mineral sorting on Sr isotope is eliminated. Similar Nd-Sr isotopic evolution of Asian dust has also been detected in Northeast Pacific site GPC3[2]. We interpret decreasing Nd isotope and increasing Sr isotopic ratio during 22-1.2Ma may reflect progressive uplift of Northeast Tibetan Plateau. The source region of Asian dust manly receives debris eroded from North Tibetan Plateau and Gobi Altay Mountains. Compared to Gobi dust, Tibetan materials have much lower Nd isotopic ratio and higher Sr isotopic ratio. Uplift may increase the relative contribution of Tibetan material, and thus shift the Nd and Sr isotope to Tibetan values. Since 1.2 Ma, the loess record indicates that the detritus contribution from Tibet drops rapidly in compare with that from Gobi. As large-scale topographic changes would not be expected in such a short time period, the source shift since 1.2 Ma is interpreted by the differing erosional responses in North Tibetan Plateau and Gobi Altay Mountains to the development of full glacial climate after the middle Pleistocene transition.

However, the patterns of Nd-Sr isotopic evolution observed in Chinese loess and pelagic sediment of Northeast Pacific has not been detected in ODP 1208 core in Northwest Pacific. We find that a separate contribution of pure Gobi dust by winter monsoon may explain the very different pattern recorded in ODP 1208 core. The Nd-Sr isotopic record in ODP 1208 core may reflect competition between Taklimakan dust and Gobi dust, which may have great potential in paleoclimatic and tectonic applications.

[1] Chen *et al*. (2007) Geochim. Cosmochim. Acta **71**, 3904-3914. [2] Pettke *et al*. (2002) Paleoceanography **17**, 1031.

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