Zircon U-Pb and Hf isotopic constraints on the magmatic and tectonic evolution in Iran

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This study reports new zircon LA-ICPMS U-Pb ages and Hf isotope compositions, coupled with whole-rock Ar-Ar age data and geochemical analyses, for magmatic rocks of Cenozoic age from the Urumieh-Dokhtar magmatic arc (UDMA) in Iran. The UDMA has been divided into three parts by latitude of ~35°N and ~31°N in this study. The northwestern UDMA show two distinct age periods: (1) the older period of 53-27 Ma exhibits zircon $\varepsilon_{Hf}(T)$ values from +11.8 to +1.8; and (2) the younger period of <11 Ma exhibits zircon $\varepsilon_{Hf}(T)$ values from +12.8 to +5.9 and reveals the same formation time as the collision-related volcanism in eastern Anatolia proposed by Keskin [1]. The central and southeastern parts of UDMA yield ages of 51-16 Ma with zircon $\varepsilon_{Hf}(T)$ values from +12.8 to -1.3 and ages of 45-5 Ma with zircon $\varepsilon_{Hf}(T)$ values from +15.7 to +1.1, respectively. The overall zircon $\varepsilon_{Hf}(T)$ values implicate that at least three significant episodes of mantle input occurred in the middle Eocene (~40 Ma), the early Oligocene (~30 Ma) and the late Miocene (~10 Ma). Zircons from the youngest magmatic rocks in central UDMA, however, show much negative $\varepsilon_{Hf}(T)$ values from +8.1 to -1.1, suggesting contamination of crustal materials has played an important role in the middle Miocene magmatism in this region. Furthermore, the pre-collisional, calc-alkaline magmatism in the UDMA appears to cease southeastward, that implies the diachronous collision occurred between Arabia and Eurasia and started in Armenia and northwestern Iran.

[1] Keskin (2007) *Geol. Soc. Amer. Spec. Paper* **430**, 693-722.

Optimization of a low-background liquid scintillation counter for the determination of ^{222}Rn and Uranium isotope in ground water

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An analytical method for the measurement of the ^{222}Rn and Uranium isotope in water sample by liquid scintillation counting technique using LKB Wallac Quantulus 1220 liquid scintillation counter(LSC) equipped with pulse shape analyzer(PSA). We have optimized the pulse-discrimination capabilities of the detector to achieve the best α/β separation and the lowest detection limits possible. LSC was calibrated using the optimization of PSA with ^{241}Am and ^{90}Sr/^{90}Y as well as ^{226}Ra. The optimum PSA level for the measurement of ^{222}Rn was 100 when measuring a sample containing 8 ml water and 12 ml of Optiphase HiSafe™ 3 scintillation cocktail. By the analysis of ^{226}Ra standard, ^{222}Rn counting efficiency and precision were found to be 91.6 ± 3.6% and 2%, respectively. Detection limits of ^{222}Rn for 5 hours counting were counted to be 0.11 Bq/L.

A solvent extraction method was used for the measurement of uranium isotope in ground water samples. The effect of solution volume was not significant, the error being less than 5% for solutions ranged from 100 to 1000 mL at pH 2. The uranium extraction efficiency was found to be the maximum at pH 2 while the pH was varied from 0.5 to 10. We dispersed 20 mL of liquid scintillation for both solvent extraction and alpha/beta discrimination in one liter of water at pH 2. The extraction efficiency of uranium isotopes was near 96% according to the NIST standard. Using the method, the lower detection limit for uranium was determined to be 0.018 Bq/L, with the counting time of 300 min. The results of this study were also compared to those obtained by the conventional ICP-MS measurement. It is demonstrated that the suggested method is valuable to determine the optimum extraction and measurement conditions for uranium in ground water

The analytical method obtained from this work was also applied to the determination of ^{222}Rn and uranium isotopes in some ground water samples.