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Isotope dilution analysis of Selenium and Tellurium in chondrites

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Selenium and tellurium belong to the moderately volatile elements, with fairly similar equilibrium (50%) condensation temperatures (697 and 709 K, respectively) at 10^{-4} bar for a gas of solar-system composition [1]. Both are mainly hosted in chondrites iron sulfides due to their strong chalcophile affinity. While the purely chalcophile element Se is exclusively hosted in sulfides [e. g. 2], the siderophile element Te can also be incorporated in the metal phases [e. g. 1]. In CK and R chondrites and refractory inclusions in CV chondrites Te additionally forms noble metal-rich tellurides such as chengbolite ($PtTe_2$) and moncheite ($PtTe_2$) [e. g. 3, 4]. To further constrain early cosmochemical processes responsible for the (primary) depletion and/or (re)distribution of these two elements, precise Se and Te abundances were determined for different groups of unequilibrated chondrites. For this purpose ^{77}Se and ^{125}Te enriched spikes were added to typically 50 mg of meteorite sample powder which was subsequently dissolved by HF-HNO_3 acid digestion. Chemical separation followed by using thiol cotton fiber (TCF). Measurements were performed by hydride generation multi collector ICP-MS. This method provides accurate and precise Se and Te abundances for chondritic samples. So far, concentrations were determined for a number of bulk carbonaceous chondrites, enstatite chondrites, ordinary chondrites, and Rumuruti chondrites. Selenium and tellurium abundances are in general agreement with literature values [e. g. 2, 5]. Uniform Se/Te were found for CI, C2 ungr. (Tagish Lake), CR2, CM1, and one of the CM2 chondrites (Nogoya), whereas other CM2, CV3, CO_3, and CH2 chondrites show slightly lower Se/Te. Ordinary chondrites, low iron enstatite and Rumuruti chondrites have consistently higher Se/Te than carbonaceous chondrites. The data suggests that Se/Te discriminate ordinary, enstatite, and Rumuruti chondrites from carbonaceous chondrites. Furthermore a weathered piece of Allende appears to confirm the suggestion that Se in chondrites is easily affected by terrestrial weathering [e. g. 2, 4].

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