

Effective halogen and sulfide getters for noble gas measurement on submarine hydrothermal fluids

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Hydrothermal activity is an essential phenomenon to drive geochemical differentiation on the Earth's surface, which should form polymetallic massive sulfide ores. Noble gas isotopes are regarded to be a powerful tracer even for the geochemical study on hydrothermal activity; however, there are abundant interference volatiles, e.g. halogens and hydrogen sulfide. Here, we designed a new preparation system to remove such volatiles using non-traditional gettering materials. This new preparation system consists of following components: the water preparations system, composite gettering system (halogen getter, sulfide getter and Ti-Zr getter), cryogenic pump, SAES-getter pump (SORB-AC) and charcoal trap to analyze the all noble gases (He, Ne, Ar, Kr and Xe). The three types of getters effectively remove halogens, sulfides, abundant water vapor and other active gases within ten minutes for respective gettering step. After the absorbing sea water by cold trap and collection Ar-Kr-Xe fraction in the charcoal trap, the gettering procedure were taken under the following orders: 1) halogen gettering, 2) sulfide gettering, 3) water vapor and active gases. Then, respective He and Ne fraction, separated with cryogenic pump, was measured. Next, Ar, Kr and Xe fraction were further purified and separated with charcoal trap, respectively. Further, the new preparation system has compact volume, which needs small amount of seawater sample of 2-5 cc in volume. It is almost 1/20 compared to the typical requirement for He isotope measurement.

Here we report the better performance of new version of the renewed power supply unit (GVI-5400), noiselessness and better stability, with the new noble gas preparation system and getter effects.