

Noble gas composition in micrometeorites

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Extraterrestrial noble gas preserved in micrometeorites provides important information on its origin and history. In this presentation, I summarize the study of noble gas measurements for individual Antarctic micrometeorites. Helium isotopic ratio is one of the most sensitive indicators to justify the extraterrestrial origin since extraterrestrial materials have significantly different isotopic ratio from terrestrial one. Solar-derived He, whose $^3\text{He}/^4\text{He}$ ratio is two orders of magnitude higher than terrestrial atmosphere, is enriched in micrometeorite, proving their extraterrestrial origin. Ne isotopic compositions show the light noble gases trapped in micrometeorites are assigned to solar energetic particles (SEP) and cosmic ray exposure ages are very short compared with stony meteorites except for a few particles, which have extremely long exposure ages. Ar isotopic compositions clearly show that the source of micrometeorites is not ordinary chondrite but carbonaceous chondrite-like planetisimals since $^{40}\text{Ar}/^{36}\text{Ar}$ ratio of all unmelted micrometeorites is lower than the terrestrial air. Heavy noble gas compositions also support the idea.