

Anorthosite-rich breccia 1153 identified as a lunar meteorite

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New lunar meteorite

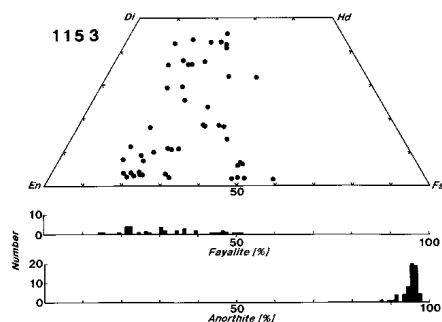
Over thirty meteorites have been identified as the lunar origin, such as the first lunar meteorite Yamato-791197 from Antarctica. A meteorite found at Antarctica, which it has been tentative name of 1153, have been indentified and classified as a lunar meteorite. Under the polarizing microscope, it shows typical breccia polymict with igneous rock consisting mostly of fragmental plagioclase, pyroxenes and less amount of olivine in the fine-grained glassy dark matrices with glass spherules. The texture of this specimen is very similar to some of the lunar meteorites consisting of anorthosite regolith breccia.

Mineral and bulk chemical compositions

Pyroxene compositions are wide range of those of Mg-rich and Ca-rich without those of Fe-rich one (Figure). Mg-rich orthopyroxene range from En77.9 to En39.5, and clinopyroxene also shows wide compositional rang with more Ca-rich one (over Wo45). Olivine is more Mg-rich and shows wide compositional rang from Fo85.4Fa14.6 to Fo49.0Fa51.0. Most fragmental plagioclases are non-maskelynite and those compositions are Ca-rich anorthosite with little compositional range. The bulk chemical compositions of this specimen have been down by the standard wet chemical analysis. The major elemental compositions are 43.91% SiO₂, 27.44% Al₂O₃, 5.20% FeO, 3.89% MgO, 18.05% CaO and 0.24% Na₂O.

Conclusion

Mineral assemblages, texture and mineral compositions of the 1153 is lunar origin and it is very similar to those of Yamato-791197 lunar regolith breccia with little differences, but differ from Asuka-881757 gabbroic lunar meteorite collected from Atarctica. In the bulk chemical composition, the 1153 is quit differ from those of the all known lunar meteorites.



References

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Marine geochemistry of the rare earths and platinum-group elements in Cambrian Ocean, Yangtze Platform, South China

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Recent researches have demonstrated that trace and rare earth elements (REE), platinum-group elements (PGE) and Re-Os isotopes in black shales are useful proxies for seawater chemistry. It is believed that many of these elements in organic-carbon rich black shales are mostly hydrogeneous in origin, which are largely sequestered from seawater at the time of deposition.

The Lower Cambrian Niutitang Formation consists of a thick black shale sequence with a regionally distributed conformable Ni-Mo polymetallic sulfide bed at its basal horizon in the Yangtze Platform, South China. The black shales show extreme enrichments for a wide range of elements, especially within the intercalated sulfide beds, elements such as Mo, Ni, Se, Re, Os, As, Hg, and Sb display >1000 times enrichment and Ag-Au-Pt-Pd show >100 times enrichment compared to bulk continental crust.

Black shales may contain various amounts of detrital mineral components. Many previous studies employ whole-rock digestion technique using HF and HNO₃, which dissolve everything in black shale including those detrital components. In this study, we use an acid-leaching (HNO₃ and HCl) technique with High Pressure Asher (HPA-S) instrument to dissolve only the authigenic components in order to obtain the primary palaeo-ocean seawater signatures. REE data of the black shales display a typical LREE-enriched pattern with distinct negative Eu anomaly and negligible or negative Ce anomaly. A good correlation has been observed for the redox-sensitive metals such as Mo, V, Mn, Cd, U. Toward more reducing environment and elevated primary production, the concentrations of these redox-sensitive elements are increasing. The initial ¹⁸⁷Os/¹⁸⁸Os ratios of black shale and sulfide bed are 0.8 and 0.78, respectively, quite close to present-day seawater value. Primitive mantle-normalized PGE patterns of black shales, sulfide ores, and siliceous rocks are similar to the upper crust PGE patterns except for Pd. It is suggested that the trace, REE and PGE concentrations and distributions in black shales record the chemistry of Cambrian Ocean in Yangtze Platform, South China.