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Lunar Meteorite QUE93069 and the Iron Concentration of the Lunar Highlands Surface

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Abstract - Lunar meteorite QUE93069 is a clast-rich, glassy-matrix regolith breccia of ferroan, highly aluminous bulk composition. It is similar in composition to other feldspathic lunar meteorites, but differs in having higher concentrations of siderophile elements and incompatible trace elements. Based on electron microprobe analyses of the fusion crust, glassy matrix, and clasts, and instrumental neutron activation analysis of breccia fragments, QUE93069 is dominated by nonmare components of ferroan, noritic-anorthosite bulk composition. Thin section QUE93069,31 also contains a large, impact-melted, partially devitrified clast of magnesian, anorthositic norite composition. The enrichment in Fe, Sc, and Cr and lower Mg/Fe ratio of lunar meteorites Yamato-791197 and Yamato-82192/3 compared to other feldspathic lunar meteorites can be attributed to a small proportion (5–10%) of low-Ti mare basalt. It is likely that the nonmare components of Yamato-82192/3 are similar to and occur in similar abundance to those of Yamato-86032, with which it is paired. There is a significant difference between the average FeO concentration of the lunar highlands surface as inferred from the feldspathic lunar meteorites (mean: ~5.0%; range: 4.3–6.1%) and a recent estimate based on data from the Clementine mission (3.6%).