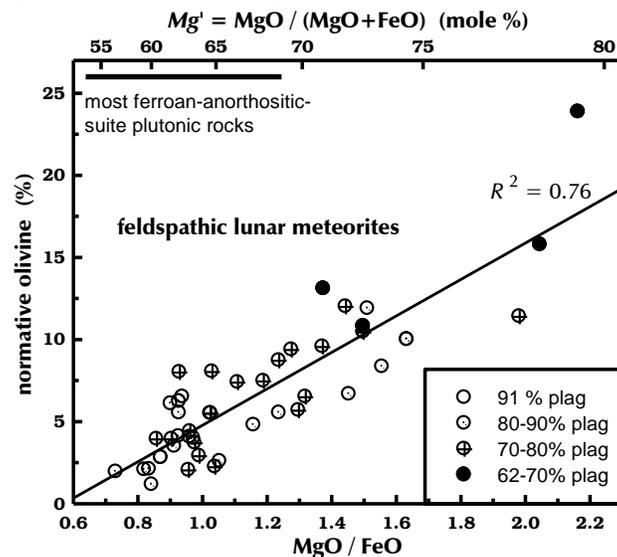


### IN THE FELDSPATHIC HIGHLANDS OF THE MOON, HIGH MgO/FeO EQUALS HIGH OLIVINE ABUNDANCE

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MgO/FeO of the lunar crust, its variation laterally and with depth, and the mineralogical control on MgO/FeO provide fundamental constraints on lunar crust formation [1]. Interest in olivine in the feldspathic highlands has increased with better orbital techniques for determining its abundance [2]. Feldspathic lunar meteorites provide the most representative samples of the composition and mineralogy of the upper crust of the Moon [3].

The normative abundance of olivine increases with whole-rock MgO/FeO among 45 stones of 36 lunar meteorites from the feldspathic highlands, all breccias with 62–91% normative plagioclase, < 7% FeO, < 15  $\mu\text{g/g}$  Sc (low mare component), < 3  $\mu\text{g/g}$  Sm (low KREEP component), and < 300  $\mu\text{g/g}$  Ni (minimal Fe and Mg from meteorites). The correlation is a simple consequence of olivine being more magnesian than pyroxene, on average, in the rocks of the feldspathic crust.



Those meteorites with the lowest MgO/FeO have  $Mg'$  at the low end of the range (<65) of ferroan-anorthositic-suite plutonic rocks [4], have little normative olivine (2–7%), and are the most feldspathic (mean plagioclase: 82%). All of those with  $Mg'$  greater than the range of most ferroan-anorthositic-suite plutonic rocks have moderate abundances of normative olivine (10–25%) and tend to be more mafic (mean plagioclase: 72%). FeO concentrations of meteorites in the figure range from 2.5 to 6.0 %, a factor of 2.4, whereas MgO concentrations range from 2.2 to 12.9 %, a factor of 5.9. Conclusion: Mafic anorthosites are mafic largely due to MgO and olivine and less so to FeO and pyroxene. These sample-based observations are relevant to interpretation of data collected over the highlands from orbiting spacecraft (e.g., [4,5]).

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