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# The importance of plagioclase in the reflectance spectra of Fe, Mg mixtures: a better understanding of spectra from Lunar and Hermean terrains.

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Spectra obtained on Lunar highland and on Mercury show low contrast features. We suggest the interference of adjacent absorptions bands due to different minerals as a possible cause of low contrast spectra. While the combined effects of $Fe^{2+}$ absorptions in various clinopyroxene, orthopyroxene and olivine mixtures have been widely studied, the spectroscopic effects of plagioclase have been considered only for <0,26 wt% FeO-bearing compositions, even if plagioclase is considered an important constituent of Lunar and Hermean terrains.

Here we consider mixtures composed by various abundances of multimineral grains and plagioclase, separated from cumulate rocks of a layered intrusion belonging to the anorthosite kindred. Three different Fe, Mg multi-mineral compositions have been considered. The first is olivine-free and consists of clinopyroxene En45-Wo46 (43.9%) and orthopyroxene En77 (56.1%). The second one is olivine-poor and includes orthopyroxene En86 (70%) and olivine Fo87 (30%). The third one, olivine-rich, is composed by orthopyroxene En82 (28.2%), clinopyroxene En45-Wo46 (3.4%), olivine Fo84 (68.4%). Two distinct plagioclase compositions, having FeO wt.% concentration of 0.36 (medium-iron), and 0.5 (rich-iron) were systematically mixed to each starting assemblage. The amount of plagioclase in the mixtures ranges between 30% and 90%. Mixtures with grain sizes of 63-125 $\mu$m and 125-250 $\mu$m were prepared. Bidirectional reflectance spectra (i=30°, e=0° angle phase) on these mixtures were acquired at the SLAB (Spectroscopy Laboratory, Iasf-INAF, Roma) in the VIS-NIR range (0.3-2.5 $\mu$m).

Preliminary results show that increasing plagioclase content produces higher albedo and lower spectral contrast.

In olivine-free mixtures, plagioclase produces a flattening in the 1.2 $\mu$m region at about 70% of medium-iron plagioclase and 50% of iron-rich plagioclase; for higher content of plagioclase a clear absorption band appears. In olivine-poor mixtures, the presence of plagioclase is clearly recorded only for more than 80% concentration, where it begins to form an absorption band; for lower content, plagioclase can not be discriminated because it forms a composite band with the third absorption of olivine in the 1.2 $\mu$m spectral region. In olivine-rich mixtures, plagioclase can not be resolved even for more than 90% plagioclase content. In both olivine-poor and olivine-rich mixtures, plagioclase, though not distinct, is revealed by spectral variations of the composite band in the 1.2 $\mu$m region, particularly by the center band shift toward longer wavelength. This behaviour is similar for both the 63-125$\mu$m grain size and the 125-250$\mu$m one.

On the other hand, even considering Fe, Mg mixtures only, we observed the importance of the relative amount of the Fe, Mg minerals on the band intensity control. For the 70% orthopyroxene and 30% olivine (olivine-poor) mixtures, both olivine and orthopyroxene are resolved in the reflectance spectra; while in olivine-rich mixtures, consisting of 68% olivine and 28% orthopyroxene, orthopyroxene absorption band disappears in the spectra.

Ongoing work is focused on analysis of Fe, Mg mixtures composed entirely by olivine and on the analysis of very fine samples, in order to a better understanding of the featureless spectra.