PLAGIOCLASE INFLUENCE IN MIXTURES WITH VERY LOW MAFIC MINERAL CONTENT. G. Serventi[1] , C. Carli[2],and M. Sgavetti[1].[1]Department of Physics and Earth Sciences, "Macedonio Melloni", University of Parma, giovanna.serventi@unipr.it , [2]Inaf-IAPS, Tor Vergata, Roma.

Introduction: Anorthosite is a rock composed of more than 90% plagioclase, considered one of the most important constituent of the lunar surface [1]. Anorthositic material from lunar highlands has been associated to spectra with high albedo and no clear absorption bands, interpreted as probably due to shock events [2,3,4]. Recently, M^3 has recognized the plagioclase absorption band, centered at about 1250 nm, in young, fresh and regolith-free areas, like crater central peaks, walls and basin rings [5].

In particular, the Inner Rock Mountains, in the Orientale basin [6], and the Tsiolkovsky crater [7] have been analyzed by M^3, and the spectra have been related to high content of crystalline plagioclase with low mafic mineral abundances.

Here we analyzed the reflectance spectra of mixtures composed of high plagioclase content and very low abundances of orthopyroxene and olivine, respectively.

Experimental approach: Using three natural plagioclases (pl) with different FeO wt.% content (Pl1=0.1% FeO, Pl2=0.36% FeO and Pl3=0.5% FeO) and two mafic end-members (orthopyroxene, opx, En_{82} and a forsteritic olivine, ol), 42 fine-grained (36-63µm) intimate mixtures have been prepared and their reflectance spectra (0.35-2.5µm; *i=30°, e=0°*) have been acquired with a Fieldspec Spectrometer. Plagioclase content ranges between 90-99%.

The continuum-removed spectra have been analyzed using the Origin® software, considering the variation of different spectral parameters vs. the plagioclase modal abundance.

Results: In pl-opx mixtures, Pl1 band is always less intense than opx while in Pl2 and Pl3 mixtures pl band dominates from 96% and 95% pl, respectively. However, fig. 1 shows that, even if pl band is more intense, the opx ~900 nm absorption band is visible even for 1% opx while the ~1900 nm band tends to become flat.

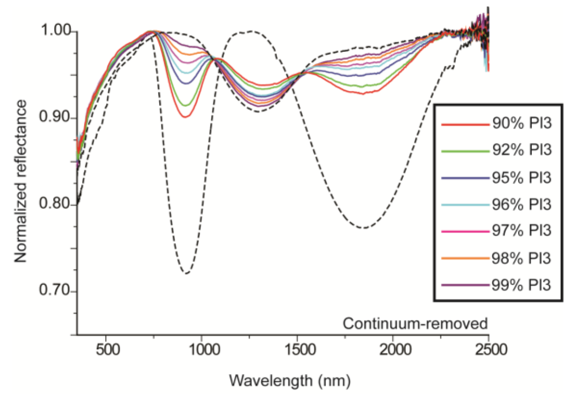

Figure 1 Pl3-opx continuum-removed reflectance spectra. Dashed lines represent the end-members; pl modal abundance increases from red to purple.

Different spectral parameters have been considered: position, intensity and width of pl and opx absorption bands as well as the flex points in the 1100 nm (H1) and 1600 nm (H2) region, that separate the two absorption bands.

Generally: (1) opx band intensity decreases and pl intensity increases (fig.2), (2) position and width do not show great variations, and (3) H1 moves to shorter wavelength while H2 moves towards the IR region (fig.3).

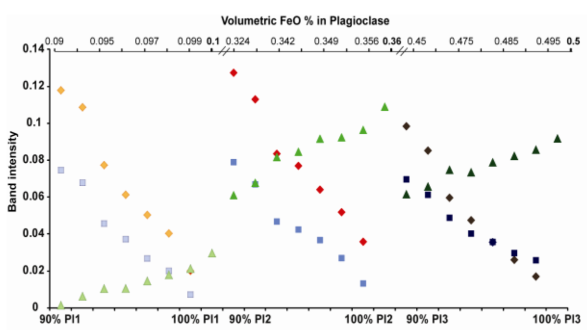

Figure 2 Opx and pl band intensities. Triangles: pl; squares: opx band II; diamonds: opx band I. Light color: pl1-mixtures; medium color: pl2-mixtures; dark color: pl3-mixtures.

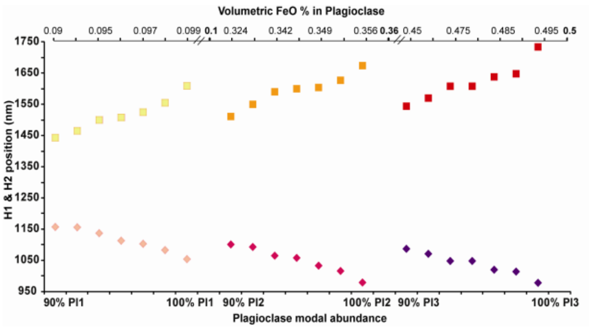

Fig.3 H1 and H2 positions. Diamonds: H1; squares: H2. Light color: pl1-mixtures; medium color: pl2-mixtures; dark color: pl3-mixtures.

In pl-ol mixtures, pl and ol absorb in the same spectral region creating a composite band at ~1200 nm. In Pl1-mixtures, ol can be recognized even for 1%, while in Pl2 and Pl3 mixtures (fig. 4) ol is completely masked from 97% and 96% pl, respectively.

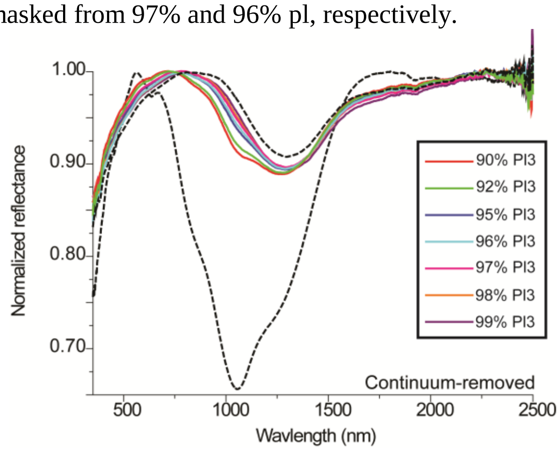

Figure 4 Pl3-ol continuum-removed reflectance spectra. Dashed lines represent the end-members; pl modal abundance increases from red to purple.

The composite band intensity, position and width have been considered vs. plagioclase modal abundance: increasing pl content, band intensity tends to decrease (fig. 5), position moves toward longer wavelength (fig. 6) and the band becomes narrower (fig. 7).

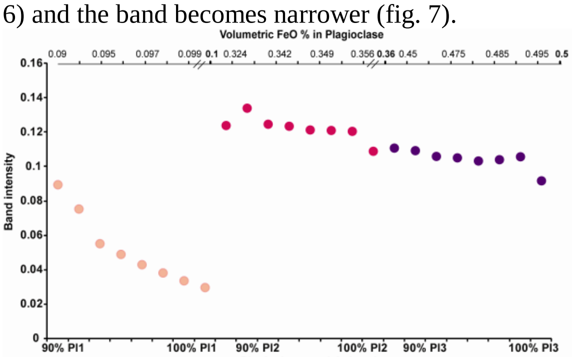

Figure 5 Light color: pl1-mixtures; medium color: pl2-mixtures; dark color: pl3-mixtures.

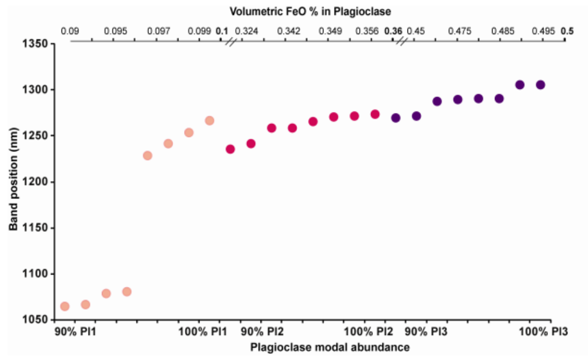

Figure 6 Light color: pl1-mixtures; medium color: pl2-mixtures; dark color: pl3-mixtures.

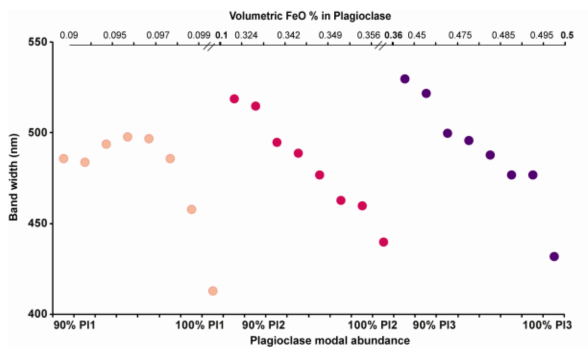

Figure 7 Light color: pl1-mixtures; medium color: pl2-mixtures; dark color: pl3-mixtures.

Conclusion and implications for planet: Pl shows a different behavior when mixed with different mafic minerals: in opx-pl mixtures, opx band I can be detected even for very small opx abundances while, in ol-pl mixtures, pl can completely mask ol absorption band; the pl content necessary to mask ol is FeO wt.% dependent. However, spectral parameters vary with mineral modal abundances helping us to detect mixture mineralogy.

Future works: Ongoing work is focused on the analysis of new mixtures, e.g. high-Ca pyroxene and pl, and on a quantitative analysis of the mixtures here presented using MGM [8].

References: [1] Cheek L.C. et al. (2010) *LPSC XLI*, Abstract #2438. [2] Bussey, D.B.J. and Spudis. P.D. (2000) *JGR*, *125*, 4235–4243. [3] Hawke, B.R., et al. (2003) *JGR*, *108*, doi:10.1029/2002JE001890. [4] Spudis, P.D. et al. (1984), *JGR*, *89*, 197-210. [5] Ohtake M. et al. (2009) *Nature*, *461*, 236-241. [6] Cheek L.C. et al. (2012) Second Conference on the Lunar Highlands Crust, Abstract #9022. [7] Cheek L.C. et al. (2012) *LPSC XLIII*, Abstract #2624. [8] Sunshine J.M. et al. (1990), *JGR*,*95*, 6955-6966.