THE LUNAR BRECCIA NWA2700: ORIGIN, DESCRIPTION, AND ITS UV TO NEAR INFRARED REFLECTANCE SPECTRUM. J. Cortés[1], J.M. Trigo-Rodríguez[1], and J. Llorca[2]. [1] Institute of Space Sciences (CSIC-IEEC). Campus UAB, Faculty Sciences, C5-p2. Bellaterra, Spain. trigo@ieec.uab.es [2] Institut de Tècniques Energètiques i Centre de Recerca en Nanoenginyeria. Universitat Politècnica de Catalunya, Diagonal 647, ETSEIB. Barcelona, Spain. jordi.llorca@upc.edu

Introduction: According with the *Meteoritical Bulletin Database* 150 lunar meteorites have been identified so far in meteoritical collections. Lunar meteorites have geochemical patterns that are similar to artificially acquired samples by Apollo and Luna missions. In any case, the lunar provenance of these meteorites is out of doubt by the similitude with terrestrial oxygen isotopes that is exclusive of Moon materials. Lunar regolith breccias are rocks produced by the continuous impact of bodies against the surface of our satellite. The Moon has not an atmosphere so meteoroids are continuously colliding with lunar surface materials and producing significant brecciation and chemical contamination [2]. Lunar breccias are usually contaminated with meteoritic siderophile elements that are coming from the impactor-forming materials as demonstrated elsewhere [3, 4]. Such rocks have not analogs on Earth due to the atmospheric barrier that prevents direct impact in this range of sizes. Our target here is NWA 2700 a fascinating 31.7 g lunar meteorite found in Morocco on 2004. This lunar meteorite consists of two distinctive lithologies: olivine gabbro and regolith breccia [5,6]. We present here a precise UV to NIR reflectance spectra of NWA 2700. We wish to explore the relation between the mineralogy, the size of the grains and the reflectance. In fact, previous work revealed interesting links between lunar soil mineralogy and its reflectance properties [6].

Technical procedure: A selected 1mm thick section of NWA 2700 was mounted on a slide to allow its study. A high-resolution mosaic was generated from separate images taken with a Zeiss Scope petrographic microscope. The mosaic allow us to study the different lithologies and establish working areas for future detailed Raman studies (Fig. 1). To generate the reflectance spectrum we used a Shimadzu UV3600 UV-Vis-NIR spectrometer. This instrument allows the measurement of the transmission, absorbance and reflectance for powder, solid, or liquid samples. The standard stage for the spectrometer is an Intregrating Sphere (ISR) with a working range of 220 to 2,600 nm. The spectrometer uses multiple lamps, detectors and diffraction grates to work over a wide range of wavelengths. The light originates at one of two lamps, passes through a variable slit, is filtered to select the desired wavelength with a diffraction grating, and is then split into two alternating but identical beams with a chopper. The sample beam interacts with the sample and is routed to one of two or three detectors (depending on the sample stage). The reference beam interacts with the reference material and then goes to the same detector. The inside of the ISR is coated with a reflecting polymer called duraflect. For calibration of the detector a standard baseline was created using a conventional $BaSO_4$ substrate that provided a ~100% reflectance signal better than 1σ all along the 300-2,000 nm range. The samples analyzed for comparison were a couple of sections of Puerto Lápice eucrite and NWA1943 howardite (Fig. 2). The sampled area during the measurements corresponds to a slot of 2×1 cm^2 that was consistent with the size of the samples

Preliminary results: The mosaic shown in Fig. 1 well exemplifies the complexity of this rock. The regolith region in the specimen exhibits very fine grain materials that we wish to study carefully. In this sense, we plan to continue the characterization of minerals using Raman techniques. On the other hand, reflectance spectrum of NWA 2700 exhibits clear similitudes with HED suite meteorites. For sake of comparison we have plotted here NWA 1943 howardite, and the recently recovered Puerto Lapice eucrite [7]. As plagioclase and pyroxene minerals are dominating minerals in the studied sections, the spectra exhibit similar features. Despite of this, NWA 2700 has distinctive slopes that could be consequence of the size of the grain and the presence of other minerals.

Conclusions: NWA 2700 is a fascinating lunar breccia. We plan to continue the characterization of the different minerals forming this section by using Raman, and other techniques. We also wish to extend the reflectance study to IR wavelengths by studying powders of NWA2700 using a Smart Orbit ATR (Attenuated Total Reflectance) IR spectrometer. We will compare with other data from lunar rocks, soils and lunar meteorites to learn more about its origin.

References: [1] Warren P.H. (1985) *Ann. Rev. Earth Planet. Sci.* 13, 201-240. [2] Cushing J.A. et al. (1999) *Meteorit. Planet. Sci.* 34, 185-195. [3] Warren P.H. (2003) In *Meteorites, Planets and Comets*, Ed. A. Davis, Treatise on Geochemistry (vol. 1), Elsevier-Pergamon, Oxford, pp. 559-599. [4] Connolly H. C. et al. (2006) *Met. Bull. 90*, 1389–1390. [5] Bunch T.E. et al (2006) *LPS XXXVII*, Abstract #1375. [6] Pieters C.M. et al. (2002) *Icarus* 155, 285-298. [7] Llorca J. et al. (2009) *Meteorit. Planet. Sci.* 44, 159-174.

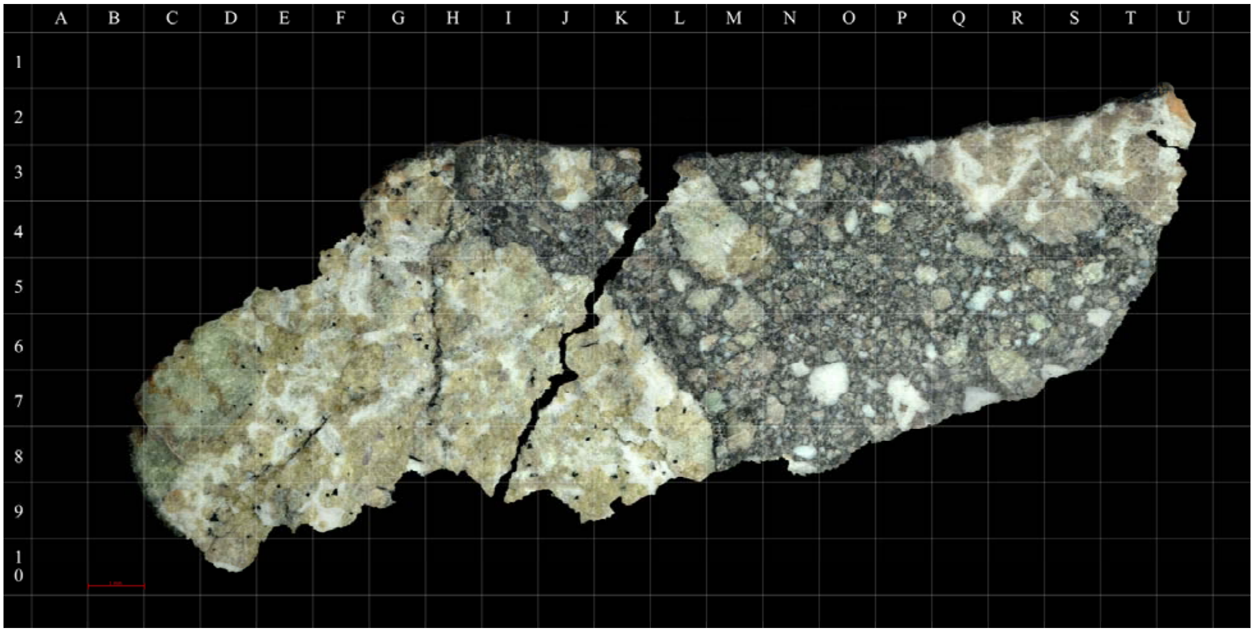

Figure 1. A medium resolution mosaic of the analysed section of NWA 2700 obtained from reflected light images taken with a Zeiss Scope petrographic microscope. Note the very distinctive lithologies forming the rock. On right appears the dominant olivine gabbro while a fine-grained regolithic breccia dominates the right part of the image. The grid is 1 mm wide.

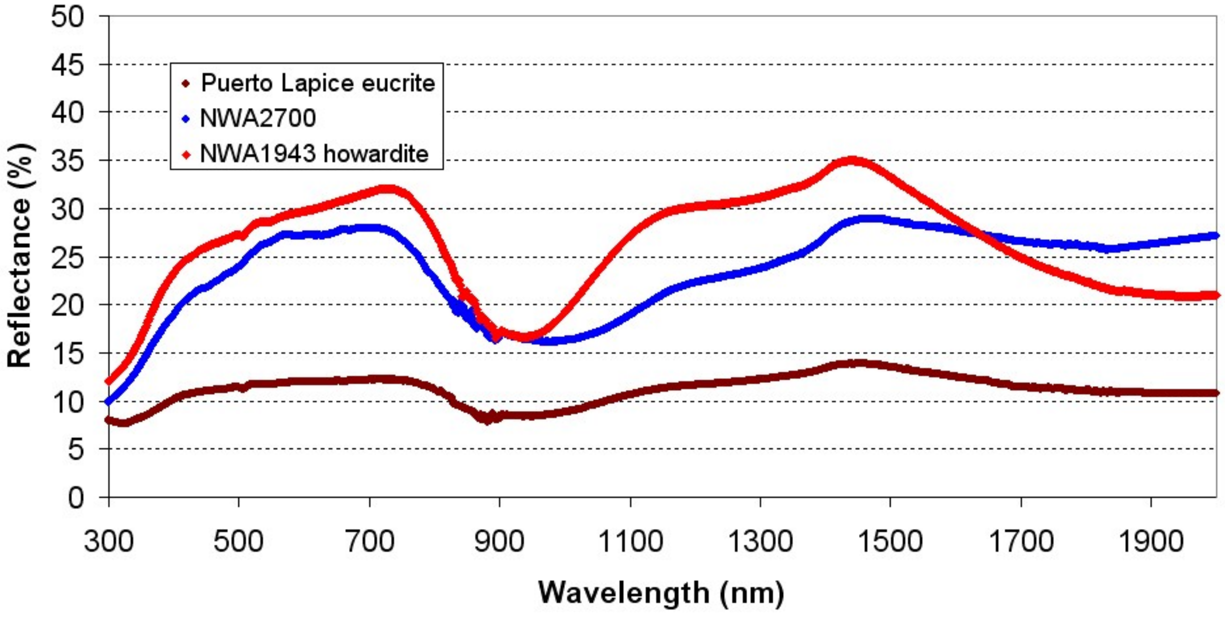

Figure 2. UV-visible-near IR spectra of lunar breccia NWA2700 compared with selected HED meteorites associated with 4 Vesta. Absolute reflectance is plotted versus wavelength.