**MINERALOGY OF THE LUNAR METEORITES KALAHARI 008 AND KALAHARI 009.**

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**Introduction:** In 1999, the first meteorites from Botswana were recovered [1]. Two of these samples were found close to the small village of Kuke (Kalahari 008 and Kalahari 009) and are chemically and petrographically different lunar rocks. However, it is suggested that both samples represent distinct lithologies of one meteoroid that broke apart at the find site.

**Results:** During geological field work Kalahari 008 and 009 were found roughly 50 m apart in front of a small dune in September 1999.

Kalahari 008 (598 g in weight) is an anorthositic breccia having typical clasts of lunar highland breccias (e.g., feldspathic crystalline melt breccias, granulitic lithologies, cataclastic anorthosites etc.) embedded within a well-lithified matrix. An impact melt spherule indicates that this rock derives from the regolith. Olivine crystals are much less frequent and generally smaller than pyroxenes and display a distinct bimodal distribution in composition (~$Fa_{42-66}$ and $Fa_{78-98}$). Pyroxenes show a wide range of compositions ($Fs_{14-77}$ $Wo_{0.5-39}$ $En_{8-76}$). Most plagioclases in clasts and matrix are anorthites ($An_{92-99}$), typical of lunar highland mineralogy.

Kalahari 009 is a single rock of about 13.5 kg. In texture and chemistry it differs from Kalahari 008. Considering bulk composition and mineralogy Kalahari 009 can best be classified as a VLT lunar mare basalt. However, the rock is a breccia consisting of fragments of basaltic lithologies embedded in a fine-grained matrix. Many of the basaltic clasts have a coarse-grained subophitic texture. Clasts and matrix display the same composition. Pyroxene is the most abundant phase followed by plagioclase (mostly $An_{86-96}$). Olivine (mostly $Fa_{80-100}$) occurs less frequently.

Both samples are significantly shocked: all clasts are shocked to almost the same degree. Characteristic shock features include mosaicism and planar fracturing in feldspar and olivine (in both samples) as well as localized impact melting (within Kalahari 008). Partly, the transformation of plagioclase to maskelynite is visible in both samples. Such shock effects are typical for shock pressures of at least 15 – 20 GPa according to the calibration scheme of Stöffler et al. [2] for ordinary chondrites (S4).

Kalahari 008 clearly is an anorthositic breccia from the lunar highlands. Preliminary results of geochemical studies of Kalahari 009 (Zr/Hf = 30.2 and Nb/Ta = 17.4; C. Münker, pers. communication) are typical for lunar rocks.

**Conclusions:** Although Kalahari 008 and 009 represent different rock types (anorthositic breccia vs. basaltic breccia) it is suggested that they belong to one meteorite fall. It would be very surprising to find two individual lunar meteorites this close to each other. Kalahari 008 contains a distinct population of Fa-rich olivine clasts ($Fa_{78-98}$). These olivines are similar in composition to olivine in Kalahari 009. This may indicate that the Kalahari 008 breccia was formed in close vicinity to the Kalahari 009 basalt, and that both textural different rock types were ejected from the Moon as one polymict meteoroid.

**References** [1] Sokol A. K. and Bischoff A. (2005) *Meteoritics & Planetary Science* (submitted). [2] Stöffler D. et al. (1988) *Geochim. Cosmochim. Acta* 55:3845-3867.