'BALLEN SILICA' IN IMPACTITES AND MAGMATIC ROCKS. M. Schmieder[1], E. Buchner and J. Kröchert, Institut für Planetologie, Universität Stuttgart, Herdweg 51, D-70174 Stuttgart, Germany, [1]martin.schmieder@geologie.uni-stuttgart.de.

Introduction and background: Ballen silica, in the modification of α-quartz ('ballen quartz') or α-cristobalite, has been regarded as an impact-characterstic microscopic feature for decades. The report of ballen silica in impact melt rocks from the Mien impact structure (Sweden; the impact melt rocks were formerly considered as rhyolites) was the first description of ballen silica in impactites [1]. Later, ballen silica was noted in impactites from a number of impact structures worldwide; currently, ballen silica is known from 38 terrestrial impact structures. A thorough review and listing of ballen silica in impact breccias is given by [2-3]; we briefly add ballen silica in Wabar glass (Saudi Arabia; Fig. 1a) and impact melt rocks from Suvasvesi South (Finland; Fig. 1b) to the current database. Recent studies pointed out that ballen quartz is 'an impact signature' [4] and that 'in nature, ballen silica has not been found anywhere else but associated with impact structures and, thus, these features could be added to the list of impact-diagnostic criteria' [2]. However, ballen-textured α-cristobalite was also reported in rocks not related to impact (see also [5]).

Discussion and suggestions: As a result of volume shrinkage upon the high-low inversion of cristobalite [6-7], the ballen texture was described as a microscopic feature characteristic for α-cristobalite *a priori* (ballen texture variably described as *Germ.* 'Schuppenstruktur'='[fish] scale structure' [8], 'Ballenstruktur'='ballen structure' [8-11], 'Dach-ziegel-Textur'='roof tile texture' [12], as well as 'crackled texture' [13] in thin section, respectively). In particular, ballen-textured α-cristobalite is known to occur, for example, in andesites of the Citlaltépetl (Pico de Orizaba) volcano, Mexico (Fig. 1c), in latiandesite from the Puracé volcano, Colombia [10] (their p. 49; Fig. 1d), and in sandstones altered by the hydrothermal interaction with volcanic basalt intrusions at the Marda Pass in the Harar Highlands, Ethiopia [8] (his p. 218). Furthermore, ballen-textured α-cristobalite was noted in Lunar basalts [12-13]. According to these reports (e.g., [8] with a petrographical description of the ballen-textured silica very similar to that given by [7]) and to photo-micrographs [10-12], ballen-textured α-cristobalite in impactites and 'endogenic' silica-saturated volcanic rocks exhibit the same optical appearance. As the majority of ballen silica grains was observed in impact breccias, we suggest that ballen silica can be considered as an impact-characteristic microscopic feature, amongst others. Nevertheless, we propose that the definition of ballen silica as an 'impact-diagnostic' feature – in the strict sense – should be used with care.

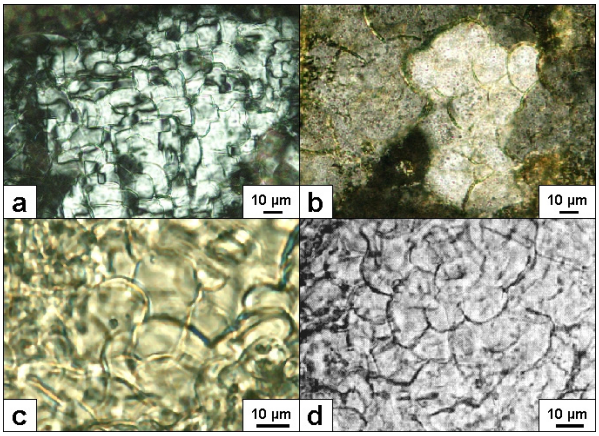

Fig. 1: Ballen silica in impactites and magmatic rocks. a) Wabar glass, Saudi Arabia (cross polarized light); b) impact melt rock, Suvasvesi South, Finland (ballen quartz; cross polarized light); c) andesite, Citlaltépetl volcano, Mexico (plane polarized light); d) lati-andesite, volcano Puracé, Colombia (image from [10]).

References: [1] Holst N. O. (1890) *Ryoliten vid sjön Mien. Sveriges Geolog. Undersök. C, 110*, Stockholm, Sweden, 50 p. [2] Ferrière et al. (2009) *Eur J. Mineral.* DOI: 10.1127/0935-1221/2009/0021-1898 (in press). [3] Ferrière L. et al. (2008) *LMI IV*, Abstract #3011. [4] Ferrière L. and Koeberl C. (2007) *70th MetSoc Meeting*, Abstract #5079. [5] Schmieder M. and Buchner E. (2007) *Geochim. Comsochim. Acta*, *71*, A897. [6] Flörke O. W. (1956) *Ber. Dtsch. Keram. Ges., 33*, 319-321. [7] Carstens H. (1975) *Contrib. Mineral. Petrol., 50*, 145-155. [8] Müller G. (1960) *Beitr. Mineral. Petrogr., 7*, 207-231. [9] Tröger W. E. (1982) *Optische Bestimmung der gesteins-bildenden Minerale, Teil 1 – Bestimmungstabellen*. Schweizerbart, Stuttgart, 188 p. [10] Pichler H. and Schmitt-Riegraf C. (1987) *Gesteinsbildende Minerale im Dünnschliff*. Enke, Stuttgart, 230 p. [11] Pichler H. and Schmitt-Riegraf C. (1993) *Gesteinsbildende Minerale im Dünnschliff*. Enke, Stuttgart, 233 p. [12] MacKenzie W. S. and Guilford C. (1981) *Atlas gesteinsbildender Minerale in Dünnschliffen*. Enke, Stuttgart, 97 p. [13] Taylor L. A. and Misra K. C. (1975) *Proc. Lunar Sci. Conf., 6*, 165-179.