GRAINS OF A FEATHER… LOW-SHOCK PRESSURE DEFORMATION IN SILICATE MINERALS FROM THE WETUMPKA IMPACT STRUCTURE, ALABAMA, USA

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Introduction: Poelchau and Kenkmann [1] recently discussed the importance of feather features (FFs) as low-shock regime (3 to ≤10 GPa) indicators in quartz. Our study of felsic pegmatites and augen bodies exposed near the center of the Wetumpka impact structure demonstrate that FFs are not unique to quartz and may develop in other silicate minerals such as plagioclase and zircon. Here we report detailed analyses of the observed microfabrics and their intimate association with shatter cones and highly sheared rocks in what probably is a collapsed central peak.

Feathered Quartz and Shatter Cones: Polymict breccia units at Wetumpka contain weakly to moderately shocked (≥10 GPa) quartzite clasts that exhibit FFs in addition to typical planar deformation features (PDFs) [2]. Nearly homogeneous quartz pegmatite blocks from the proposed central uplift, which show shatter cone-like surface striations, contain abundant FFs along with a variety of planar fractures (PFs) and distinct curviplanar features (CPFs). Complete shatter cones have formed in small hematite-rich zones within the quartzite. In a single meter-scale block, FF and shatter cone-bearing quartzite grades directly into traditional shear-induced features, including thin pseudotachylitic veins. This sample provides a rare opportunity to document the transition from "shear" to "shock" fabrics.

Poached quartz? Feathered quartz at Wetumpka commonly appears glazed in hand sample. Under the microscope, this phenomenon appears to correspond to especially dense concentrations of FFs around which quartz has become disordered and yellow in color. We speculate that this involves migration of fluids at high temperatures, akin to "toasted quartz."

Plagioclase: Deformation features in pegmatitic plagioclase crystals from the same part of the crater range from feather and ladder-like fractures to complete recrystallization of alternate albite twins.

Zircon, Muscovite, and Garnet: Zircons associated with these rocks exhibit both planar fractures and PDF-like features aligned with basal and pyramidal forms (e.g., {20*l*}). FFs are observed parallel to the prism {100}. Kink-banded muscovite grains appear highly sheared and show multiple cleavages. Garnets do not show obvious evidence of damage, but quartz inclusions in them exhibit basal and $\{10\bar{1}3\}$ PDFs possibly indicating modest amplification of the shock wave across the interface between the contrasting materials.

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References: [1] Poelchau M. H. and Kenkmann T. 2010. Abstract #1987. 41st Lunar & Planetary Science Conference. [2] Morrow J.R. and King D.T. 2007. *Meteoritics & Planetary Science* 42:A5009.