

**XIUYAN IMPACT CRATER, CHINA.** M. Chen, Guangzhou Institute of Geochemistry, Chinese Academy of Sciences, Wushan 510640, Guangzhou, China, mchen@gig.ac.cn.

**Introduction:** Xiuyan impact crater is a bowl-shaped crater 1.8 km in diameter and 150 meters deep. It located at 40°21'55"N, 123°27'34"E in Xiuyan county of the Liaoning province, northeastern China. The feature and origin of this circular depression has caused concern from many Chinese geologists since the 1970s. The impact origin of this crater has been confirmed recently [1-3]. The impact crater was formed before 50000 years ago [2].

**Geological and landform features:** The crater is situated in low mountain-hill region with local relief ranging from 50 to 300m. The crystalline basement around the crater is made up of Proterozoic metamorphic rocks composed of granulite, hornblendite, gneiss, tremolite marble and marble. The crater bottom is filling with Quaternary lacustrine deposits. A small village is situated on the crater floor. Same to surrounding mountain hills, the rim of crater is mostly covered by undershrub. A narrow gap was formed at the north-eastern rim, which provides an entrance into the inner crater.

**Crater structure:** A drilling at center of the crater reveals very thick lacustrine deposits 107m deep at the upper part of the floor. A breccia lens 188m thick lies under lacustrine deposits in the depth interval from 107 to 295m. Below 295m are fractured basement rocks. Small amount of suevite is found in the breccia lens, especially in the interval from 260 to 295m. Although most region of the rim is mantled by soils and vegetation, accumulation of debris and megablocks of rocks was locally exposed on the outer slope on the southern rim. Since the crater is produced in the region of mountain hills, part of its crater rim should have been formed by accumulation of impact-produced fragments of basement rocks.

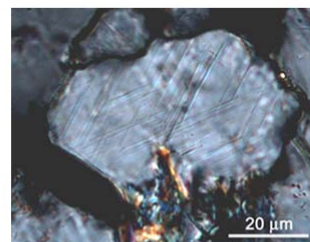
**Shock metamorphism:** Suevite recovered from the drill cores shows typical features of shock-metamorphism. The suevite is melt-bearing polymict breccia. The rock melt glass occurring as ovoid, droplet or irregular patches is identified through the matrix. Some glass attaches to surface of rock fragments or clasts and forms as wrap layer.

Quartz occurring in clasts of gneiss and granulite within suevite displays multiple sets of planar deformation features up to 5 sets, predominately rhombohedron forms of  $\{10\bar{1}2\}$  and  $\{10\bar{1}3\}$  and  $\{10\bar{1}1\}$ . Diaplectic feldspar glass has also been identified in gneiss clasts containing quartz with multiple sets of planar deformation features.

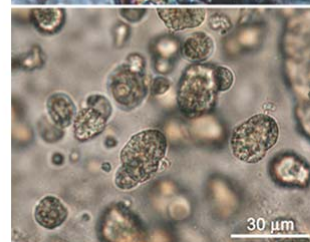
Abundant coesite is found in quartz glass in gneiss clasts of suevite. Coesite embedded in silica glass occurs as polycrystalline aggregates of stringers and irregular patches, as well as granular, needle-like and dendritic crystals. The features of coesite provide evidence for crystallization from shock-produced silica melt. Shock-produced melting of quartz requires a shock pressure >50 GPa [4]. Feldspar associated with coesite-bearing silica glass transforms as vesicular glass.

**Conclusion:** The Xiuyan crater is the first confirmed impact structure in China, and it shows typical features of shock metamorphism. The peak shock pressure can be constrained up to 50 GPa. The existence of planar deformation features in quartz, coesite embedded in silica glass, and diaplectic feldspar glass provides crucial evidence for impact origin of this crater.

**References:** [1] Chen M. et al. (2010) *CSB*, 55, 1777–1781. [2] Chen M. et al. (2010) *EPSL*, 297, 306–314. [2] Chen M. et al. (2011) *Meteoritics & Planet. Sci.*, 46, 729-736. [4] Stöffler D. and Langenhorst F. (1994) *Meteoritics*, 29, 155–181.



Planar deformation features in quartz



Coesite in silica glass