

LETTER

Lightning-induced shock lamellae in quartz

**RETO GIERÉ^{1,*}, WOLFHARD WIMMENAUER², HILTRUD MÜLLER-SIGMUND², RICHARD WIRTH³,
GREGORY R. LUMPKIN⁴ AND KATHERINE L. SMITH⁵**

¹Department of Earth and Environmental Science, University of Pennsylvania, Philadelphia, Pennsylvania 19104-6316, U.S.A.

²Institut für Geo- und Umweltwissenschaften, Albert-Ludwigs-Universität, 79104 Freiburg, Germany

³GeoForschungsZentrum Potsdam, Department 4, Telegrafenberg, 14473 Potsdam, Germany

⁴Institute of Materials Engineering, ANSTO, Private Mail Bag 1, Menai, New South Wales 2234, Australia

⁵International Relations, ANSTO, P.O. Box 2001, Kirrawee DC, New South Wales 2232, Australia

ABSTRACT

Using transmission electron microscopy we show that planar deformation lamellae occur within quartz in the substrate of a rock fulgurite, i.e., a lightning-derived glass. These lamellae exist only in a narrow zone adjacent to the quartz/fulgurite boundary and are comparable to planar deformation features (“shock lamellae”) caused by hypervelocity impacts of extra-terrestrial objects. Our observations strongly suggest that the lamellae described here have been formed as a result of the fulgurite-producing lightning strike. This event must have generated a transient pressure pulse, whose magnitude, however, is uncertain at this stage.

Keywords: Shock lamellae, fulgurite, lightning, planar deformation features, transmission electron microscopy