

## Lightning-induced shock lamellae in quartz

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At Les Pradals, Commune de Mons, Département Hérault (France) lightning struck a coarse-grained granitic rock consisting of quartz, potassium feldspar, albite, muscovite, and bluish tourmaline (schorl), as well as accessory Mn-rich almandine garnet, apatite, and zircon. The granite surface is covered by black, vitreous surface coatings, which exhibit a thickness of only a few tens of micrometers and are characteristic of a rock fulgurite, i.e. a lightning-derived glass. The fulgurite layer is highly vesicular and consists of an optically isotropic matrix, in which many small ( $< 1 \mu\text{m}$  to several  $\mu\text{m}$  across) non-isotropic mineral inclusions are embedded. The matrix also contains black, carbonaceous particles, which cause the observed opacity.

Using transmission electron microscopy we show that planar deformation lamellae occur within quartz in the substrate of this rock fulgurite. The 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. The lamellae are oriented parallel to one of the prism faces and also to the composition plane of Dauphiné twins.

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.