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A note on the occurrence of fulgurite in Tamil Nadu

Charles Darwin had described in 1892 sand fulgurites near the mouth of the river Plate in Argentina. Other

glassy rocks are Obsidian, Australite, Darwin glass, Libyan Desert glass and Moldavite The most common natural

glass, Obsidian, is a volcanic glass formed by the rapid cooling of lava flowing out of a volcano. A glazed, dull grey-green glass-like rock was noticed at the first atomic blast site - Trinity site, New Mexico in 1945. This rock, appropriately called trinitite or atomsite, was formed by the melting of rock in the intense heat of the atomic blast and subsequent instantaneous solidification.

The occurrence of fulgurite described here is located 2 km from Udhiyur, along the mud road to Karukampalayam village, close to the road from Dharapuram to Kangayam in the Periyar District of Tamil Nadu (Figure 1). A lightning strike that occurred on the night of 7 June 1996 had resulted in the creation of fulgurite. An eye-witness¹ account of the site described that 'the melt resembling pitch, were scattered and thrown around the base of an electric pole, a few even on a nearby tree which incidentally was scorched by the intense heat of the lightning. The tree had also bits of pitch-like rock sticking to its burnt branches. Surprisingly, the pitch-like formation scattered around the electric pole for about 10 to 15 sq m was radiating heat and some of the holes and cracks formed were smoking for two days.'

The following observations were made during a visit to the site on 6 January 1997. Graphitic granites and pegmatites with a large amount of quartz marked the vicinity of the occurrence. The fulgurites were centered on a 2-m by 1.5-m deep crater close to the base of a concrete electric pole. They were strewn around a radius of 3 to 4 m. A large number of specimens had been

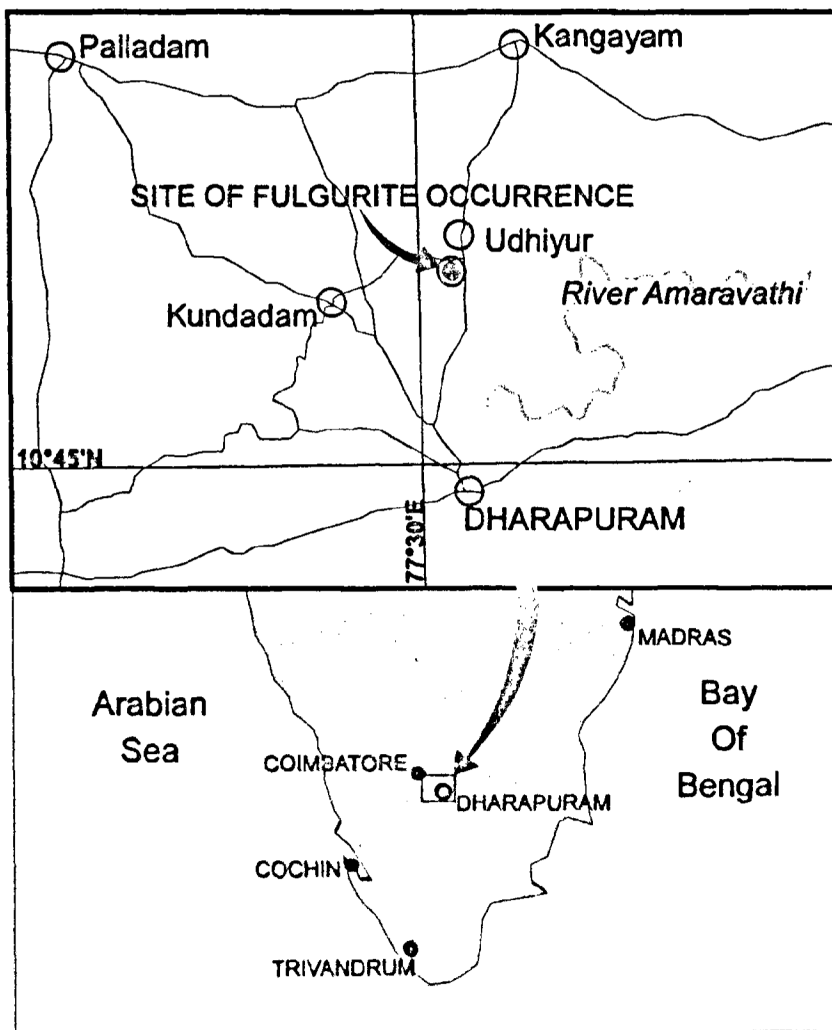


Figure 1. Location sketch showing the site of fulgurite occurrence.



removed and the impact crater partly filled in. The fulgurites were of the sand fulgurite variety and occurring as tubes of varying sizes from 1 cm to 5 cm. Smaller tubes resembling wormholes are found *in situ* around the crater. Most specimens had holes piercing the wall of tubes, suggestive of the intense heat during their formation. The inner surface was glassy and smooth while the outer surface was rough. Fine sand resembling volcanic ash, coarse sand and sometimes larger angular grains of quartz were found adhering to them. The pitch-like brittle specimens were vitreous, and made of silica. The black

appearance in these rocks is due to absorption of light by the embryonic crystals in the natural glass. Partly molten or burnt pegmatite, graphitic granite and *kankar* were also noticed near the impact crater.

Lightning is the discharge of an electric field developed in a cloud and this occurs within the cloud, from cloud to cloud or cloud to ground, beginning with a preliminary breakdown. The case under discussion is a cloud to ground discharge. There are evidences that the temperature of the air in the channel of the return stroke may reach up to 30,000°C. Since many rocks can melt at a temperature of 1,500°C, the heat generated during the stroke is more than adequate to melt the rock instantaneously. As the lightning struck the earth, it had coursed down instantly superheating, melting and fusing the topsoil. Lightning on striking water has been known to throw up a plume of steam. In this case, the molten sandy soil had been thrown in a similar way by the

superheating and the force of the multiple return strokes that occurred subsequently. After cooling, glass-like hollow tubes and rocks resembling molten wax had formed.

The texture and shape of the fulgurites are typical of superheating, instantaneous melting and rapid cooling. Also the scattering indicates the strength of the multiple lightning strokes that threw the molten rock around the point of impact. The spread and the size of the fulgurite tubes, which are fairly larger than in the earlier reported cases, saw that the cloud to ground lightning strike that caused this must have been a very powerful one.

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