

The Origin of Pseudotachylites (H. J. Melosh, Lunar and Planetary Lab, University of Arizona, Tucson AZ 85721)

Geologist James Shand first recognized pseudotachylites near the Vredefort structure in 1916. They appear to be black, glassy veins that often contain broken fragments of country rock. The veins range from millimeters thick to masses many meters in extent. Since this discovery they have puzzled several generations of geologists.

Pseudotachylites are evidently due to rapid melting of rock in place and seem to be associated with environments, such as faulting, landslides and impacts, where rock is put into rapid motion. I examine the basic constraints controlling the formation of pseudotachylites in the rapidly sheared rocks in the vicinity of a large meteorite impact. The prevailing opinion among many geologists is that pseudotachylites are formed by friction melting of rock. The principal mystery of pseudotachylite formation is not that friction can cause melting, but that it seems to form thick masses of it. Yet such thick masses ought to preclude melting by reducing the friction between sliding rock masses. I propose that a solution to this conundrum is that the melt produced by sliding on narrow shear zones is extruded into the adjacent country rock, thus keeping the sliding surfaces narrow.