The majority of the Mio-Pleistocene monogenetic volcanoes in Western Hungary had, at least in their initial eruptive phase, phreatomagmatic eruptions that produced pyroclastic deposits rich in volcanic glass shards. Electron microprobe studies of volcanic glass from the pyroclastic deposits revealed a primarily tephritic composition. A shape analysis of the volcanic glass shards indicated that the fine-ash fractions of the phreatomagmatic material fragmented in a brittle fashion. In general, the glass shards are blocky in shape, low in vesicularity, and have a low-to moderate microlite content. The glass-shape analysis was supplemented by fractal dimension calculations of the glassy pyroclasts. The fractal dimensions of the glass shards range from 1.06802 to 1.50088, with an average value of 1.237072876. The average and mean fractal-dimension values are similar to the theoretical “Koch-flake” (snowflake) value of 1.262, suggesting that the majority of the glass shards are bulky with complex boundaries. Light-microscopy and backscattered-electron-microscopy images confirm that the glass shards are typically bulky with fractured and complex particle outlines and low vesicularity; features that are observed in glass shards generated in either a laboratory setting or naturally through the interaction of hot melt and external water. Textural features identified in fine- and coarse-ash particles suggest that they were formed by brittle fragmentation both at the hot melt-water interface (forming active particles) as well as in the vicinity of the interaction interface. Brittle fragmentation may have occurred when hot melt rapidly penetrated abundant water-rich zones causing the melt to cool rapidly and rupture explosively.