The composition of snowflake obsidian

Donald Kasper 7-3-2017

I was asked the other day if I had studied the composition of snowflake structures in obsidian, and if so, what is it? Are they cristobalite? The answer is conclusively no. The snowflakes in obsidian are sanidine feldspar structures, identified by spot reflectance infrared spectroscopy aimed on dense samples of these structures. As lava cools the silica and feldspar dominating lava will separate from the potassium feldspars. This is not noticeably seen for plagioclase feldspars. Plagioclase is in basaltic rocks, and sanidine is in rhyolitic and related rocks. Why do reports continue to circulate that these structures are cristobalite? Because they confuse orbicular structures which can be feldspar or cristobalite, and in obsidians like the Coso Mtns dominated by the China Lake Naval Base, they are cristobalite orbs. Morphologies (shape-types) matter, but many people typically run different morphologies together. Snowflakes, tendrils, symplectite, myrmekite names all describe these tubular and dendritic cluster structures that are all feldspars of various types.

So let us look at the Mindat explanation for snowflake obsidian:
"A variety of Obsidian
A rock - a natural volcanic glass containing white 'snowflake' crystal patterns of the mineral cristobalite, originated due to partial crystallisation of the glass."

Analysis: This definition is false. The snowflake obsidian is a rock consisting of two major minerals and as such is not a variety of anything. The snowflakes are sanidine feldspar, and the matrix is mixed cristobalite and sanidine glass. A graph of Delta, UT snowflake obsidian to compare a dense snowflake region and black glass region are attached. Red graph overlay is a snowflake cluster. Violet graph overlay is obsidian glass matrix with no snowflakes.

The Mindat statement that the obsidian has white patches is totally incorrect and deceptively wrong. The white snowflakes are geologically called symplectites, which are exsolution structures of sanidine formed as the lava cooled and the silica and sanidine separated. Below 575 C they are immiscible.

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Red graph overlay is a snowflake cluster showing sanidine feldspar. Violet graph overlay is obsidian glass matrix with no snowflakes showing cristobalite-sanidine rhyolite glass.