

Geochemistry of a Tufa Deposit at Pigeon Mountain, Georgia

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Tufa is actively accumulating in several streambeds on Pigeon Mountain, northwestern Georgia. This study examines tufa below a spring on Pocket Branch on the northwestern flank of Pigeon Mountain. We characterize spring and related surface water chemistry to determine spring water sources and assess the mechanism of carbonate deposition below the spring. Water samples were collected under low-flow conditions in late summer and analyzed for field parameters and major-ion chemistry. The spring issues from a chert- and dolostone-rich interval of the Mississippian Fort Payne Formation and subsequently flows over a series of small cascades. Calcium carbonate is deposited as a thick (10+ cm), stratified, porous apron on the cascades and as thin (up to 1 mm), dense coatings on stream cobbles in pools below the cascades. A thin layer of calcium carbonate precipitate also occurs locally on the water surface of pools. All waters are of calcium-bicarbonate type with Ca^{2+} and HCO_3^- concentrations ranging from 69 to 85 mg/L and 221 to 280 mg/L, respectively. Ca/Mg ratios range from 6.90 to 14.0. Log $p\text{CO}_2$ ranges from -2.90 to -1.77 atm. Most waters are oversaturated with respect to calcite but significant carbonate precipitation occurs only at the steepest portion of the creek, which coincides with a sharp drop in $p\text{CO}_2$. Springflow appears to be derived from the Fort Payne Formation and overlying Mississippian Limestone units. Tufa and cobble coatings are made of calcite with minor aragonite and consist of nearly pure calcium carbonate