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Thallian arsenian pyrite from submarine vents in Dominica, Lesser Antilles

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The Dominica Island, in the central part of the Lesser Antilles volcanic island arc, comprises many recent volcanoes. Fumarolic activity is common on the flanks of these volcanoes, and some of these vents are found some tens of meters below the sea level. Champagne Pool is an example of these submarine vents, and is found about 200 m NW of Pointe Guinard, 8 km S of the Roseau city.
Crusts of ore minerals, some centimeters in thickness, are produced in the proximities of venting areas. Ores are found as the cement of sand grains, and form botryoidal aggregates. Tl-rich pyrite is the main ore mineral in these aggregates, and is accompanied by lesser amounts of barite patelets and prismatic stibnite crystals, arranged in radial groups. Fine-grained crystals of thallite and other Tl-minerals are found filling late cracks in pyrite.
The botryoidal aggregates of pyrite are made up of concentric bands, less than 10 μm in thickness. X-ray mappings of these aggregates reveal strong chemical variations in the pyrite composition of these bands. Electron microprobe analyses indicate that pyrite from some bands may be enriched in heavy metals: As (up to 3 wt%), Sb (up to 15 wt%) and Tl (up to 20 wt%, generally in the range 1-3 wt %), as well as lesser amounts of Pb (up to 0,3 wt%) and Hg (up to 1,3 wt%). The introduction (or entrance) of such large cations in the pyrite structure produces a slight shift of the Raman bands of Pyrite. Such effect is also observed by x-ray diffraction. Hence, pyrite can be a possible trap for these heavy elements.