PSEUDOSTALACTITES

Boris Z. Kantor
Russian Mineralogical Society
boris_kantor@mail.ru

Specimens and photos: Boris Z. Kantor if other is not specified

Term "pseudostalactite" was introduced into the scientific usage by Raphael Eduard Liesegang (1869–1947), a German chemist and expert in photographic materials. He was an earnest scientist and a versatile personality, author of more than 800 scientific books and articles pertaining to chemistry, optics, medicine, television, history, neurology, philosophy, botany, geology, projection equipment, mineralogy, photography, Malayan grammar etc. plus collections of poems and fourteen dramatic works. In the beginning of the past century, when laboring as a scientist in a neurological clinic, Liesegang engaged in the meantime in the problem of agate genesis. He got interested in the chalcedony "icicles" sometimes occurred in agate geodes. Liesegang made a point of their physical resemblance with stalactites of caves but specified, as a fundamental difference, the absence of stalagmites beneath of them; having expressed the difference with the name "pseudostalactite" i.e. "false stalactite" (Liesegang, 1914).

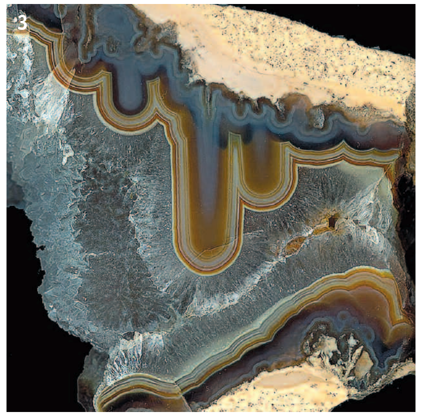
The words "stalactite" and "pseudostalactite" are well known and used today to denote whatsoever mineral formation with elongated shape. But "pseudostalactite" is, virtually, a scientific term denoting quite a specific idea. To be named "pseudostalactite" (Figure 1), a chalcedony icicle should have a tubular layered structure that would follow layers of the geode's walls (Figure 3); thready or tubular matrix in its longitudinal axis (Liesegang, 1914; Pilipenko, 1934); kidney shaped surface typical for spherulitic crusts (Godovikov *et al.*, 1987).

The analogues of chalcedony pseudostalactites were found, after a while, also for some other minerals including goethite, hematite, malachite, pyrite (Figure 4–7) and others. However, just chalcedony pseudostalactites are studied better than other ones being the most wide spread, most various and most typical representatives of this mineral body category. Their study is an example of how gradually, step by step, a theory was built capable to get to the phenomenon root.

In the last quarter of the 20^{th} century, some appropriate finds were made in the Moscow Region and Russian Far East that much contributed to develop the concepts of chalcedony pseudostalactite morphology and genesis. Among them are the pseudostalactites up to 15–20 cm long and up to 10–12 mm in diameter in chalcedony geodes and their fragments (Figure 1) from the limestones and eluvium of the Staraya Sitnya village vicinities, Moscow region. The chalcedony layers often interchange in them with the quartzine ones following the layer sequence of the geode wall; some pseudostalactites are covered with small quartz crystals (Figures 2 and 8). These chalcedony-quartzine-quartz pseudostalactites may measure up to 2–3 cm in diameter. Some finds were also made in the Prioksky Quarry of Shchurovsky Deposit (Moscow Region, Russia) (Figures 3, 9). In the meantime, some interesting chalcedony pseudostalactites were found in the rhyolitic lavas of the Sergeevskoe agate locality, Primorsky Krai, Russia (Figure 10). Chalcedony pseudostalactites are wide spread

1. Fragment of **chalcedony** geode with pseudostalactites up to 3 cm long. Staraya Sitnya, Moscow Region, Russia. Collected in 1968–1972.

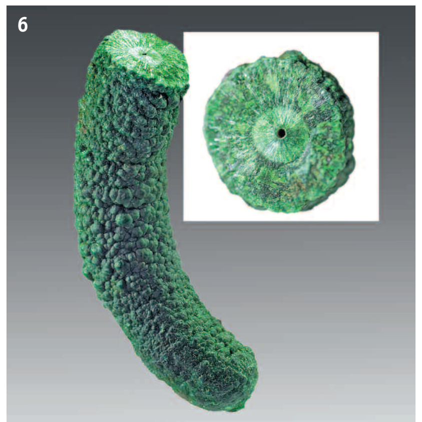
2. Fragment of **chalcedony** geode with pseudostalactites covered with **quartz** crystals. 14 cm wide. Staraya Sitnya, Moscow Region, Russia. Collected in 1968–1972.



3. **Chalcedony-quartzine-quartz** pseudostalactites, up to 3 cm long. Polished section. Prioksky quarry, Shchurovskoe deposit, Moscow Region, Russia. Specimen and photo: V.A. Maltsev.

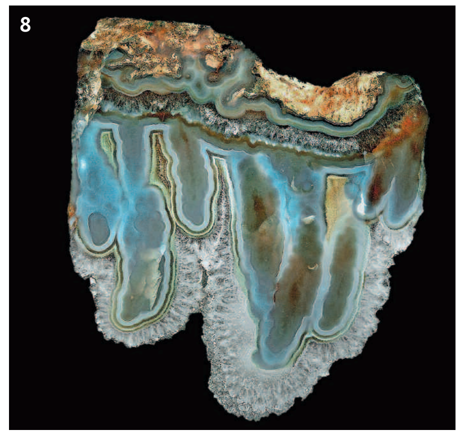
4. **Pyrite** pseudostalactites, up to 6 cm long. Mikhailovsky Mine, Kursk Magnetic Anomaly, Russia.

5. **Goethite** pseudostalactites, up to 4 cm long. Sulzbach-Rosenberg, Bayern, Germany.



6. **Malachite** pseudostalactite, 7.5 cm long. China. Inset: Transverse fracture with axial pipe about 1.5 mm in diameter.

7. **Hematite** pseudostalactites, up to 3.5 cm long. Supat Gah, Quhistan, Pakistan.



8. Fragment of agate geode with **chalcedony-quartzine-quartz** pseudostalactites. Polished section 12 x 12 cm. Staraya Sitnya, Moscow Region, Russia. Collected in 1968–1972.

23. **Malachite** pseudostalactites, 5 cm high. DR Congo.

24. **Malachite** pseudostalactites, polished section. Width 15 cm.

25. **Malachite**, fragment of doubled pseudostalactite on axial pipes 5 and 1.2 mm in diameter.

26. **Malachite**, fragments of pseudostalactites up to 4 cm long on solitary and doubled axial pipes.

27. **Malachite**, fragment of axial pipe. Outer diameter 7 mm.

24-27: Kamenushinskoe Deposit, Kemerovo region, Russia. Specimen: O.S. Bartenev. Photos: B.Z. Kantor.

phous"), often multi-layered malachite (Figure 25), sometimes with hollows and holes in their walls. For more details see our article (Kantor, 2016).

The mentioned facts and observations create a picture of the Kamenushinskoe malachite pseudostalactites genesis. Malachite originated as the result of reaction between the copper sulfate (product of copper sulfide oxidation) and calcium bicarbonate, the product of limestone leaching by atmospheric water with carbon dioxide dissolved in it:

$$2CuSO_4 + 2Ca(HCO_3)_2 = \underset{\text{malachite}}{Cu_2CO_3(OH)_2} + 2CaSO_4 + H_2O + 3CO_2 .$$

Copper sulfate was in the stagnant solution filling a hollow volume while the bicarbonate solution was entering from outside by dribbles through the holes of the roof. In consequence of the chemical reaction, a tubular malachite partition appeared around the dribble preventing a disorderly mixing of reagents. However, the bicarbonate solution was infiltrating through the pores in the pipe wall, and the malachite growth centers generated on

28. **Hematite** pseudostalactites (*view from different sides*). 4.5 cm high. Hollow axial channel about 1 mm wide and spherulitic crust structure can be seen. Irhoud Mine, Marrakesh-Safi, Morocco. Specimen and photo: R. Christianson.

29. Fragment of **hematite** pseudostalactite with hollow axial channel about 0.3 mm wide. Stanislawow, Jawor Area, Lower Silesia, Poland.

the pipe surface (Figure 22) giving birth to the cylindrical spherulitic crust. The exhaled gas of carbon dioxide made hollows on the pipe surface.

Therefore, the P.P. Pilipenko's idea (1934) of "*stalky pipes*" to be the feeding solution conductors got its implementation though some different one.

Pseudostalactites of other minerals are mostly known as straight or slightly bent "icicles" (Figures 4, 5) or wreckage pileups (Figure 7). They always contain an axial channel (Figures 28, 29) or a tubular pivot, a matrix for the overgrowing spherulitic crust. The absence of a pipe (Figure 28) does not mean the pseudostalactite to have been grown over an "emptiness". A pipe for sure really was but its matter chemically coinciding with that of the psedostalactite has been crystallized in a while and merged with the latter having left a hollow channel. As can be seen, pseudostalactites of various minerals are mainly morphological analogues of chalcedony pseudostalactites which also makes probable their genetic entity. Presumably can be taken that those minerals are able to produce pseudostalactites that can create semipermeable partitions to prevent disorderly mixing of the input reagents. However, the concrete considerations need more new observations and facts.

The author is thankful to Dr. John White for his editing this article translation into English.

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