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REACTIONS BETWEEN AGATE NODULES AND PENETRATING CO_2 RICH FLUIDS – A CL-EMS STUDY

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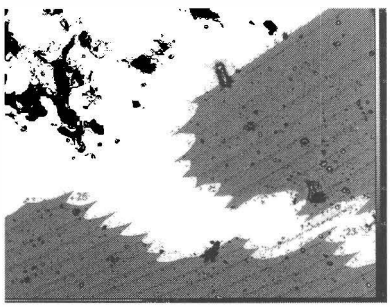
Nodules filled with chalcedony, so called agates, are commonly found in the Permian andesites (melaphyres) in Northern Bohemia. Cathodoluminescence observations on agates allow recognition of fabrics that are invisible in transmitted light. Agates from localities in the Krkonose piedmont basin are strongly carbonatised. This is nicely seen under CL because of the bright orange CL colour of carbonate, which contrasts with rather dull CL colour of chalcedony. Several replacement textures were documented using CL, and subsequently analysed by microprobe.

Calcite occurs in agate in several positions:
1. Carbonate, mostly calcite, penetrates the agate along brittle cracks or along contact zone of two adjoining spherical growth centres. Contacts between calcite and chalcedony are sharp.
2. Carbonate forms very thin veins between two layers of chalcedony. The contacts are sharp too.
3. Fig. 1 documents a structure, where calcite penetrates and replaces chalcedony layers along a brittle crack. The boundary between calcite and chalcedony is irregular but rather sharp.
4. Fig. 2 shows diffuse contacts between primary chalcedony and secondary carbonate. The thinner homogenous zones are formed of pure SiO_2 without carbonate, whereas the brighter inhomogeneous zones are enriched in carbonate; however the SiO_2 concentrations remain high. Fe correlates positively with Ca, and Al with Si.
5. Relicts of chalcedony in carbonate could be found occasionally, indicating mostly complete replacement of chalcedony by calcite.



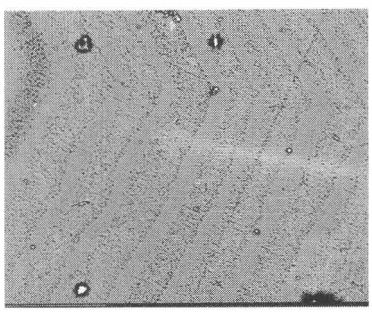


Fig. 1 and 2. Carbonates used a pre-existing cracks or boundaries between chalcedony layers to enter the agate. The replacement occurs probably by two mechanisms – dissolution and precipitation (Fig. 1) or by filling of pores in the chalcedony (Fig. 2). Carbon and oxygen isotope data indicate a meteoric origin of the fluids that are responsible for carbonatisation.