Pearls defects evidenced by EPMA, EDS and coupled SEM-μ-Raman spectroscopies.

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PEARLS DEFECTS EVIDENCED BY EPMA, EDS AND COUPLED SEM-MICRO-RAMAN SPECTROSCOPIES

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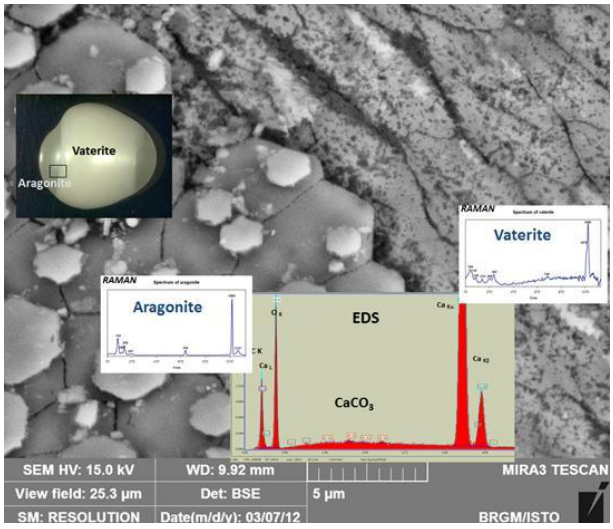
Pearls (*Hyriopsiscumingii*) are produced from a natural biomineralisation process controlled by organic molecules. Pearl biocrystal is a hybride composite organic / mineral (3 % / 97%). The regular form of pearl mineralization is aragonite, a hexagonal polymorph of calcium carbonate. This biocarbonate shape is a stack of nanometric thickness hexagonal plates stacked along the c-axis of the aragonite crystal. It diffracts as a single crystal so called MESOCRISTAL. This mineralization produces well-known shiny and "pearly" aspect.
Sometimes, pearls show a biomineralisation defect characterized by a lack of shine (also called "milky pearl"). It has been established that this defects is related to the change in mineralization form from hexagonal aragonite to orthorhombic vaterite.



SEM picture of pearl surface at the interface of the defect (inset is the pearl, squared is the zone observed); superposed are the EDS spectrum of CaCO3 on both sides and Raman spectra showing the different polymorphs.

SEM images and Raman spectra acquired in the SEM are used to characterize the biocrystals structure of both regular and defective nacre of pearls. The mineralization growth process was also investigated coupling cathodoluminescence (CL) imaging with EPMA mapping. Growth rings were evidenced this way, related to a daily alternation, either side of the interface, i.e. in vaterite and aragonite. EPMA is used for mapping and quantifying trace elements on the same banded structure: CL signal in both aragonite and vaterite is connected to Manganese traces (few hundreds of ppm). Higher Mn contents are observed in vaterite zone compared to that of aragonite.