MOGANITE IN THE CHALCEDONY VARIETIES OF CONTINENTAL CHERTS (MIOCENE, MADRID BASIN, SPAIN). M. A. Bustillo[1], J. L. Pérez-Jiménez [1,2], A. M. Alonso-Zarza[3] and M. Furio[1].
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Introduction: The Miocene of the Madrid Basin includes relatively frequent cherts and opaline cherts, which show different quartz textures under thin section in optical microscopy. This work discusses the amounts of moganite (in relation to quartz) obtained in different quartz textures (calcedonite, quartzine, lutecite, microcristaline quartz mosaics, etc.), using micro-Raman and optical microscopy.

Thermo Fisher DXR Raman microscope, which has a point-and-shoot Raman capability of 1-µm spatial resolution was use with laser source at 532 nm. Moganite shows bands at 128, 141, 220, and 502 cm^{-1}, with the latter being the most intense peak. Variations in the moganite/quartz ratio are revealed by the intensity ratios of the main symmetric stretching-bending vibrations of alpha-quartz (465 cm^{-1}) and moganite (502 cm^{-1}) respectively. This method provides a measure of the moganite content and its spatial variation. The data are interpreted in relation to their genesis and the type and environmental setting (shallow lacustrine carbonates, palustrine carbonates, palustrine gypsums and palustrine clays) of the host rock silicified.

The samples are attributed to the Middle Miocene and can be considered of similar age. It allows ruling out variations in the presence of moganite due to its disappearing with time (ageing). All the samples are formed in surficial environments and dolomite or gypsum are present in most of the cases. Optical microscopy shows many quartz textures are interconnected with opal, and in these cases it can be deduced that they formed by recrystallization of the opal (ageing). When opal does not appear, it is interpreted that quartz varieties could were formed directly by replacement of the host rock.

Results: After the realization of 250 analyses, it has been observed that all the varieties of chalcedony (calcedonite, quartzine and lutecite) contain moganite. The qualitative estimations of moganite/quartz (intensity of peak 502 of the moganite divided between intensity of peak 465 of quartz and multiplied by 100) show interesting data. The values in each texture can change very much (e.g. in the lutecite it can change from 26 to 82% or in calcedonite from 32 to 70%). Therefore, every studied chalcedony will be composed of alternating quartz and moganite domains in all three dimensions, with variable domain sizes. But also these variations can be due to the orientation of the analyzed section. Moganite was always absent in the macrocrystalline and mesocrystalline quartz, and occasionally in some calcedonite cements.

When different chalcedony varieties are found in the same sample, the lutecite shows the highest amounts of moganite (48-59%), followed by calcedonite (36-55%) and quartzine (31-36%). When quartzines are not well formed and show a fibrous or microcrystalline nuclei and a border of elongated and interpenetrated megaquartz/mesoquartz crystals, then moganite only was detected in the nuclei. The opaline zones produce flat spectrums with no peaks, but when microcrystalline mosaic quartz is distinguished in optical microscopy, then moganite is found.

Calcedonite is pervasive in the carbonate sedimentary settings without dolomite or gypsum. The moganite proportion in the chalcedony is variable, with a higher variation in the calcretes (37-77%) and the shallow lacustrine limestones (32-70%) than in the palustrine limestones (25-38%), although these data can only to reflect the orientation of analyzed sections. No discrimination has been possible to make in relation to ageing from opal or cementation in these settings. Length-slow fibrous forms (lutecite and quartzine) are dominant in the palustrine evaporitic and Mg-rich settings (with gypsum and dolomite-magnesic clays respectively). In these settings length-slow fibrous forms have the highest variation in the proportion of moganite (26-82%).

Conclusions: Researchers have proposed that moganite actually is identical to lutecite, and therefore, moganite may prove an important indicator for vanished evaporites. Our results show that all the varities of chalcedony (calcedonite, quartzine and lutecite) can have a composite Raman spectrum of both, quartz and moganite, and it is independent of their genesis by ageing, direct replacement or cementation. The presence of moganite is also independent of the surficial sedimentary setting of the host rocks in which it formed.

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