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## Micro-Raman spectroscopy of rock paintings from Del Arco and Blanca de la Pulsera Caves, Sonora, Baja California, Mexico

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One of the most important archaeological areas of rock paintings in North America are located in the South-West part of the USA and Northern Mexico. In between 2007 and 2009 a Spanish archaeological research program considered two important caves found in Sonora, Baja California, Mexico. Micro samples from rock paintings of Del Arco and Blanca de la Pulsera caves were taken to be studied by micro-Raman spectroscopy. Different color pigments have been found in both caves: Del Arco cave is decorated with red and brown-red pictures and Blanca de la Pulsera have been painted with orange, red, dark red and white colors. These pigments have been analyzed in order to characterize the composition of the materials present in the painting panels. Hematite ( $\alpha\text{-Fe}_2\text{O}_3$ ) is the main component of Del Arco cave, as well as some anhydrite ( $\text{CaSO}_4$ ). On the other hand, in Blanca de la Pulsera cave have been identified hematite and amorphous carbon as part of the pigments. Accretions of gypsum ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ),  $\alpha$ -quartz ( $\alpha\text{-SiO}_2$ ) and some carbonates have been identified in the rocks supporting the paintings of both sites. Layers of calcium oxalates, whewellite ( $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ ) and weddellite ( $\text{CaC}_2\text{O}_4 \cdot (2+x)\text{H}_2\text{O}$ ,  $x \leq 0.5$ ) cover the pictorial panels of these caves. A microstratigraphic study of the paint used in the Del Arco cave revealed that the pigment layer is bracketed between oxalate layers. This finding is an excellent opportunity for AMS <sup>14</sup>C dating of the paint.

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