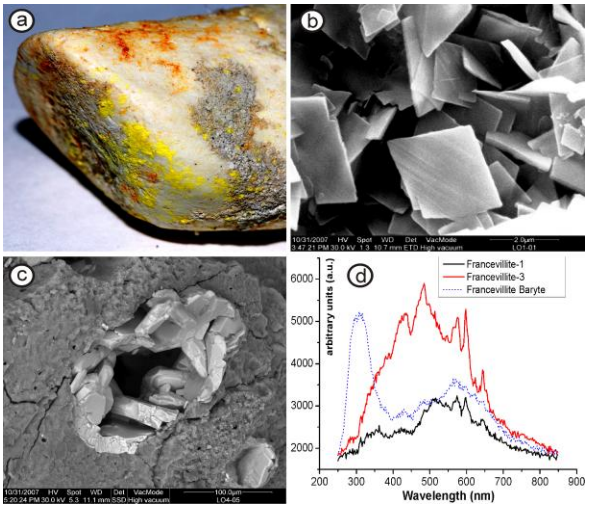
FRANCEVILLITE [(Ba,Pb)$(UO_2)_2(V_2O_8)\cdot 5H_2O$] ON THE HYDROXYPAPATITE BOND FOSSILS OF LORANCA (CUENCA, SPAIN): SPECTRUM CATHODOLUMINESCE OF URANYL-VANADATES

M. Furio, Merino, L., L. Tormo, A. Jorge, J. Garcia-Guinea [1]Electron Microscopy and Spectroscopy Laboratory. Museo Nacional Ciencias Naturales. CSIC. 28006 Madrid. Spain.
Author for correspondence: mfurio@mncn.csic.es

Geological Frame: The palaeontological deposit of fossil vertebrates Loranca-1 is located in the town of Loranca del Campo, Cuenca province, Spain. It is placed in the geological basin of Loranca in the Iberian Range. The basin is recognized as a non-sequenced foreland basin containing continental Tertiary deposits folded along with the underlying Mesozoic rocks. From the Late Oligocene to the Early Miocene the Loranca Basin was filled by two coalescing depositional systems, the Tortola and the Villalba de la Sierra fluvial fans and associated environments. These depositional systems constitute the Upper Detrital Unit with a thickness of up to 900 m, which was formed during the major compressional tectonic phase of the Iberian Range. Tectonic activity during the deposition of the Upper Detrital Unit is evident because of progressive unconformities on the flanks of some anticlines, and along the basin margins. Detailed stratigraphic correlations may be hazardous due to the complex nature of fluvial deposits. During the Tertiary period the Loranca Bassin was filled with beds of terrigenous and chemical sediments such as carbonates and gypsum up to reach 1000 m of thickness. Here we analyze the vertebrate fossils outcrops of Loranca-1 (LO-1) dated as Rambliense (Low Miocene) which is an irregular boudine-shape sized 11 m composed by heterogeneous sands modified by post-sedimentary processes. These sands host fossil bonds with uranium minerals. This Loranca deposit was formed by transported fluvial sands containing fossil bonds. Later, the post-sedimentary tectonic and diagenetic processes break the bonds and remobilize several elements such as vanadium, uranium, iron and barium. Here we studied fragments of the fossil rhino *Protaceratherium minutum*, i.e., enamel, dentin, metapode, by X-ray Diffraction, being hydroxyapatite the enamel and francolite the dentine and metapode. The mineralogical composition of the sediment is quartz (77%), microcline (22%) and calcite (1%). The radioactive yellow mineral sited on fossil bonds and sediment was identified by XRD as Francevillite [(Ba,Pb)$(UO_2)_2(V_2O_8)\cdot 5H_2O$] and was selected to be analyzed under ESEM-CL to learn on the combined effect of the uranyl (UO_2) and vanadyl (V_2O_8) groups with barium and lead cations in comparison with other similar phosphates, arsenates and vanadates with uranyl groups and other cations.

ESEM-CL: The francevillite mineral is a phosphorecent yellow coating onto the Loranca fossil bond [$Ca_5(PO_4)_3(OH)$] (Figure a). Under the ESEM Francevillite looks as perfect euhedric rhomboedral plates (Figure b). The fossil background, ie., hydroxyapatite and collagen, also contain vugs stuffed with baryte ($BaSO_4$) (Figure c). Several spectra CL were recorded from franceville crystals (Figure c) exhibiting the characteristic uranyl emission peaks at circa of 527, 545, 576, 596 nm with the low intensity attributable to the presence of large amounts of vanadium.



The tetravalent vanadium belongs to $3d^1$ ions being isoelectronic with Ti^{3+} an emission spectrum attributed to V^{4+} consists of broad band peaking at 625nm and narrow lines at approximately 528 and 529nm.

References: Daams, R., Lacomba, J.L. & López, N. (1986). Nuevas faunas de micromamíferos del Terciario continental de la Depresión Intermedia (Provincia de Cuenca, España centrooriental). *Estudios Geol*., 42: 181-196.

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