



## **The gold nuggets of the lower Pliocene Alhambra Formation (Betic Cordillera, Southern Spain)**

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The present research was devoted to the geochemical and textural characterization of gold nuggets extracted from auriferous siliciclastic deposits of the lower Pliocene continental Alhambra Formation (Betic Cordillera, Southern Spain). This Formation is mainly composed of metamorphic lithoclasts deriving both by the erosion of the Mulhacen Unit of the Nevado-Filabride Complex and the reworking of the upper Tortonian marine Dudar-Pinos Genil Formation, on its turn previously formed by erosion of the Veleta Unit of the Nevado-Filabride Complex. Particularly, the studied gold nuggets were separated from 1m<sup>3</sup> of auriferous conglomerates sampled along the right side of the Genil River, in the abandoned Lancha de Cenes Mine, exploited since Roman time for gold mining.

The recovered gold nuggets were 24 for a total weight of 0.125 g/m<sup>3</sup>. Textural analysis of gold nuggets was made by means mechanical sieving and visual comparison of roundness and form. They are sand-sized rounded to sub-rounded grains with spheroidal and cubic form. Surface analyses of the nuggets by SEM-EDS indicated that external portions show textures more porous than in the nuggets nuclei. Chemical analyses by EMPA indicated that they are constituted by pure gold with Ag and Hg as trace elements.

The gold mine capacity of the studied auriferous deposits is at least of 0.125 g/m<sup>3</sup> (lower than 0.5 g/m<sup>3</sup>; minimum value to be gold mine economically exploitable). Notwithstanding this value, the auriferous conglomerates of the Alhambra Formation reveal to be interesting under a gold mine exploitation point of view because of the gold high pureness degree.

Finally, under a geological point of view, considering that the Alhambra Formation is mainly composed of lower Pliocene alluvial fan conglomerates and sandstones formed during the uplift of the Sierra Nevada, the selected gold nuggets are secondary deposits originally derived from primary deposits related to hydrothermal gold-bearing quartz veins included in the Nevado-Filabride schists. Being gold nuggets grains of a continental deposit, an eluvial origin is not excluded on the basis of the surface features but roundness and form, data indicating that nuggets were transported, suggest that eluvial nuggets underwent also a limited alluvial process.