Origin of pure gold nuggets from Casas de Don Pedro-Talarrubias area, Central Spain*

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The Plio-Pleistocene glacis covering Neoproterozoic metasedimentary rocks in the Casas de Don Pedro –Talarrubias area attracts metal-detector enthusiasts, who since 1997 raised several thousand gold nuggets (up to 218 g). This glacis was fed by erosion products from the Paleozoic rocks of La Chimenea Sierra, located 3 km to the north. The deposit is made of ferruginous clay and sand, containing quartz and quartzite gravels of variable roundness. The origin of the gold nuggets remains controversial as no gold occurrences were reported to occur in the quartz lodes of the nearby inactive mining works.

The samples collected in this research (n=63) display little roundness, other (24) are idiomorphic and, 2 consists of fragments of quartz veins inter-grown to naked-eye visible gold. The gold nuggets could be related to auriferous quartz lodes because: a) their shape points to a low transport, b) they are found next to the quartz fragments with gold inter-grown, and c) occasionally the quartz contains gold samples similar in size to the biggest gold nuggets. Gold in nuggets displays very high fineness (99.35%wt Au, average value), dissolution voids filled by Fe oxide-hydroxide and fine-size pure gold, and lack of chemical zones and mineral inclusions. Nevertheless the gold associated to quartz fragments shows a wide range of Ag values (0.00-15.45% wt Ag, by electron microprobe), contains native copper and auroestibite inclusions and, commonly, gold is in contact to bindheimite and valentinite. Trace elements (determined by sequential dissolution of gold and ICP-MS analysis) are similar in both types (e.g., Cu, Sb, Hg and Pb), nevertheless their concentration is higher in gold inter-grown with quartz than in gold nuggets. To know if the gold nuggets and the auriferous quartz fragments have a related origin their Pb-Pb isotopic signatures were plotted in a $^{207}$Pb/$^{204}$Pb vs. $^{206}$Pb/$^{204}$Pb graph (3 gold nuggets, 3 gold samples from auriferous quartz, and 1 quartz sample). The gold nugget samples yield a $\approx$280 Ma model age (values), while the quartz and the quartz-related gold samples provide a more reliable model age of ca. 460 Ma.

It can be proposed that gold nuggets suffered a supergene alteration as a consequence of the intense pre-Miocene laterization widespread in the region, as chlorides in solution produce an almost complete leaching of Ag, modifies $^{204}$Pb and trace elements amounts, as well as eliminated the mineral inclusions. Besides, the fine-grained gold and Fe oxides and hydroxides filling the corrosion gulfs are characteristic of lateritic environments. On the other hand, the gold protected by quartz fragments remained unchanged, retaining the primary characteristics.