

### **Morphochemical Analysis of Gold in the Pinalejo Placer: The First Quantitative Analysis of Gold Wear Rate During Fluvial Transport**

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Understanding the morphochemical evolution of gold during its transport is essential for developing effective prospecting models for new gold deposits. Although numerous authors have used morphological indices to describe the shape and flattening of gold particles, to date, no studies are known to quantify gold mass loss due to mechanical wear during transport.

In this study, the morphochemical evolution of gold was analyzed at 11 sampling points along a 6 km stretch of the Pinalejo Placer, from its release at the source area. The main objective was to understand and quantify gold particle mass loss caused by mechanical abrasion during fluvial transport.

Two populations of gold particles, A and B, were identified, distinguished by their average size and morphological maturity. Population A ranged in size from 0.02 to 0.68 mm, while Population B ranged from 0.07 to 1.16 mm. The morphological contrast between these populations, together with differences in the area's geomorphology, directly influenced the particle abrasion rate.

In this regard, the wear coefficient (k) values for Population B were higher than those for Population A. Furthermore, the steeper section of the placer (P3–P6) exhibited higher k values for both populations compared to the smoother zones (P7–P11). The k values for sections P3–P6 and P7–P11 were 3.21 km<sup>-1</sup> and 1.18 km<sup>-1</sup> for A, and 3.84 km<sup>-1</sup> and 2.77 km<sup>-1</sup> for B, respectively.

Compositional analysis of gold from three source zones revealed the following Au–Ag ratios: Au<sub>72–96</sub>Ag<sub>28–4</sub> (first source), Au<sub>91–97</sub>Ag<sub>9–3</sub> (second source), and Au<sub>91–97</sub>Ag<sub>9–3</sub> (third source), which are typical of orogenic gold.