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On the Development of a Microstructural Signature During Alluvial Gold Transport

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The microstructure of crystalline solids is the result of the sum of multiple physicochemical processes. The understanding and discrimination of those processes has to rely on quantitative data. Due to the intrinsic material properties of gold, particles liberated in supergene environments can be subjected to dramatic chemical and mechanical changes. While some chemical processes are well documented (e.g., Ag de-alloying), microstructural evolution remains obscure. Deformation of gold particles in alluvial systems may result in recrystallization, grain-size reduction, and variation of crystallographic preferred orientation; those changes could have an effect on geochemical behavior of gold (e.g., diffusion).

We have conducted diffraction experiments for quantitative crystallographic preferred orientation (CPO) analysis of gold particles. The particles show different morphological indexes, tentatively related to a variety of transport distances in alluvial systems in Spain. Our results show a connection between particle shape and microstructure as an initial stage to discriminate transport/deformation models and source analysis.