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How to improve gold recovery from placer deposits in Adola region, southern Ethiopian greenstone belt

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The research area is located in southern Ethiopia, commonly termed the Adola region, about 500 km southeast of Addis Ababa and at the transition zone between the Arabian-Nubian shield and the Mozambique belt [1]. The geology of the Adola region is dominated by low- to high-grade metamorphic rocks. These rocks include Awata gneiss, Daba and Bursano meta-igneous complexes, Megado and Kenticha meta-igneous and metasedimentary units with local intrusions, and Reji amphibolite [4]. The gold occurrences of the Adola region are shear-hosted vein deposits in the Neoproterozoic volcano-sedimentary succession of rocks at greenschist to amphibolite metamorphic facies [2].

Gold mining in Adola region involved government and private company efforts, as well as local artisans who recovered gold by panning and semi-mechanized hydraulic mining methods. Present day small-scale mining in Adola uses virtually the same rudimentary and inefficient techniques as were used one thousand years ago. Statistical data for the period 1942-1996 indicate that a total of 28 tons of gold were extracted from placer deposits in the Adola area by small-scale mining [3]. Field reconnaissance in this region showed inefficiencies in gold recovery from excavated material by panning by artisans, which has led to most of the gold going to waste. These wastes typically contain economic quantities of gold that can be recovered. This situation creates favorable conditions for undertaking research in collaboration with the local geological administration with the purpose to recognize the geology, petrology, mineralogy, and geochemistry of areas with identified gold reserves. These studies are crucial in determining the causes for passing a significant part of the extracted gold from the deposit to the waste. Already initial field observations made during a 2014 reconnaissance study allowed identification of the causes of poor gold recovery and implementation of simple procedures that should reduce the loss of ore. Such procedures include the use of sieves to separate the large particles from smaller ones, cleaning larger rocks of clay and other particles, kneading the contents of the pan to break it up fully and washing samples, and using a magnet to remove magnetic black sands from the gold pan
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Samples of sediments from placer mining sites and from wastes were collected from different localities around Shakiso. Detailed knowledge of mineralogy will improve gold recovery technology and assess the feasibility of reprocessing waste that likely contains a significant amount of gold. The first mineralogical results lead to the conclusion that the ilmenite-magnetite association predominates among magnetic minerals, and a zircon-garnet-staurolite association is also present. Most of gold grains take the foliate-plate and cementation-popular forms and almost all grains show mechanical deformation.

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