GOLD PROCESS MINERALOGY: OBJECTIVES, TECHNIQUES, AND APPLICATIONS

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ABSTRACT

The extractive metallurgy of gold is largely driven by mineralogical factors such as gold particle size; association with other minerals; coatings; presence of cyanicides, oxygen consumers, and preg-robbers; presence of refractory gold minerals; locking of submicroscopic gold in sulfide and sulfarsenide mineral structures. Gold process mineralogy address all issues related to gold ore processing by the detailed study of an ore or a mill product. The methodology is widely used as a predictive tool in feasibility studies and during the process development stage, and as a troubleshooting tool for mineral processing and hydrometallurgical operations.

INTRODUCTION

Based on the gold recovery and mineral processing techniques required, gold ores are commonly classified into two major ores. Typically, free-milling ores are defined as those where over 90% of gold can be recovered by conventional cyanide leaching. Refractory ores give low gold recoveries only with the use of significantly more reagents or more complex pre-treatment process.[1]

Generally, placers, quartz vein gold ores, oxidized ores, and silver-rich ores are free-milling and gold can be recovered by gravity and/or direct cyanide leaching. Some epithermal deposits may be free-milling (such as the oxidized portion) but more commonly contain significant amounts of sulfides in which gold occurs as micrometer-sized inclusions or as submicroscopic gold and are therefore refractory. When the silver grade in an ore is high (>10 g/t) and/or the gold is present as so-called "küstelite" (Au<50%, Ag>50%) or electrum (Au 50-75%. Ag 25-50%), the processing may need to be modified. The greater reactivity of silver can influence the behavior of gold in flotation, leaching and/or recovery processes. Electrum with a high silver content may give poor gold extraction due to tarnishing of the silver. Küstelite often gives low recovery by flotation due to the formation of a hydrophilic silver-rich coating. Iron sulfide ores and arsenic sulfide ores host different proportions of free-milling and refractory gold.[2] Gold in free milling

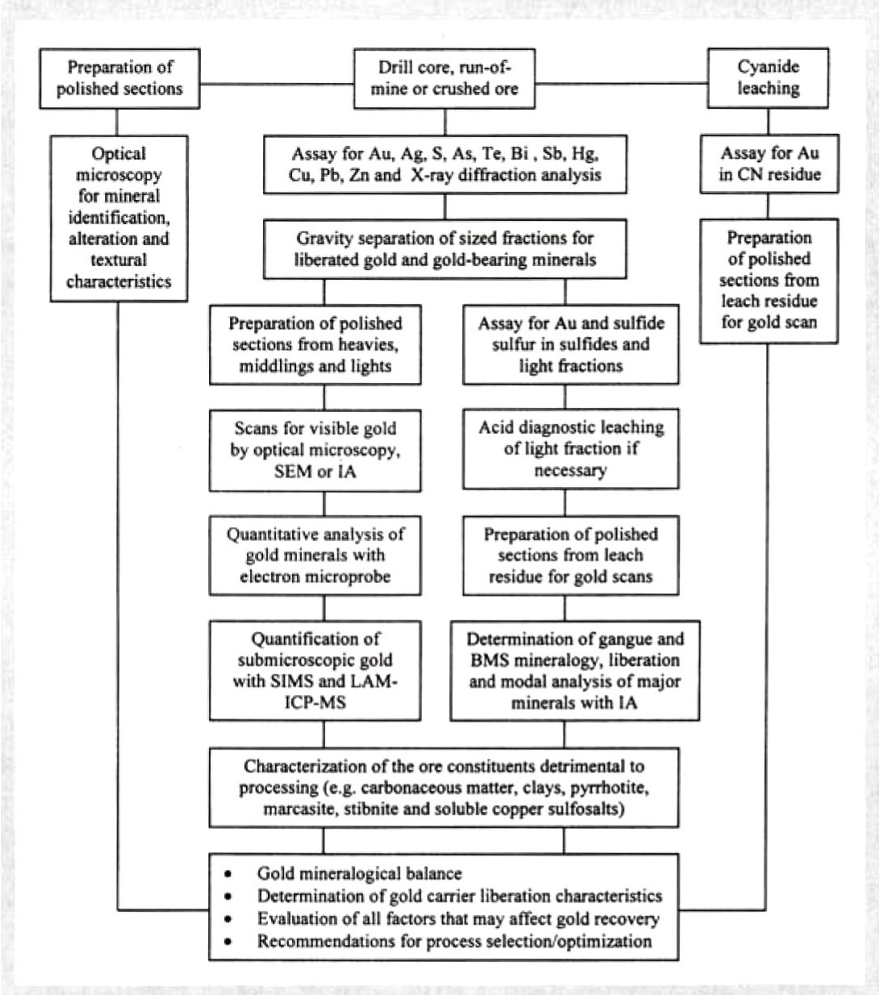

Figure 1. The general procedure used for gold process mineralogical study (modified from Zhou et al.)[1]