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On the refractory nature of precious metal tellurides

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Petzite, Cyanidation, Telluride, Gold, Silver, Electrochemistry.

Abstract

An investigation into the factors inhibiting the leaching of precious metal tellurides in cyanide solutions and initial testing of possible methods to improve leach performance was conducted. Petzite (Ag_3AuTe_2) was the principle mineral examined, along with calaverite ($AuTe_2$) and hessite (Ag_2Te). Both electrochemical measurements and batch leach experiments were employed to verify findings. It was found that tellurium is not readily oxidised under standard cyanidation conditions and thus was impeding the extraction of the precious metal elements. While this appears to be the primary problem to be overcome in leaching telluride minerals (particularly calaverite and hessite), evidence of passivation (previously noted in multiple studies) by a Te-rich layer was also observed in leach tests. Both established and new approaches to improve the telluride mineral leaching were tested to examine their effectiveness and better understand the fundamental chemistry involved. While elevated pH remains the most effective approach, actually leaching tellurides faster than pure gold, small proportions of citrate improved recovery from the gold-bearing tellurides.

Keywords: Tellurides, gold, silver, electrochemistry, leaching.