Extraction of tellurium for use in high technology as a byproduct of current mining processes

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Increasing demand of tellurium for use in high technology devices, including high efficiency solar panels, has sparked questions of future supply because of low crustal abundance (1 $\mu g\ kg^{-1}$). Key in evaluating future supplies is an estimation of Te that could be extracted from current mining processes. Tellurium is currently recovered as a byproduct of Cu extraction, but is also enriched in some Au/Ag orebodies. The goals of the present study are (1) to perform a mass balance to assess current (or potential) recovery of Te in operational mines, and (2) to assess the distribution of Te between host phases controlling Te liberation throughout the mining process.

Distribution of Te in between host minerals dictates Te behavior, particularly during early extraction, thereby directly limiting the potential for total recovery. Previous studies suggest in Cu extraction, as much as 90% of Te is lost in the initial concentrating step separating chalcopyrite from gangue minerals [1]. Further, our preliminary calculations suggest that only 16% of Te entering the smelter is recovered. Together, these results indicate very low Te recovery, but also highlight waste streams (e.g., 200+ mg Te kg^{-1} in furnace dust) that could be exploited to recover additional Te.

The solid phase speciation of Te throughout the extraction processes was examined using a combination of bulk (total elemental analysis, X-ray absorption spectroscopy [XAS], and X-ray diffraction) and grain-scale techniques (micro-focused X-ray fluoresence [μ-XRF] and electron microprobe analysis). Previous studies and our results indicate Te can occur as tellurides or can substitute for sulfur in sulfides [2, 3]. Our results agree with Chen & Dutrizac that the majority of Te in anode slimes is present as tellurides but our XAS studies also indicate a small fraction (~30% by mass) of Te^{IV} is present [4].

[1] Ojebuoboh (2008) *World of Metallurgy* **61**, 33-39. [2] Spry, *et al* (1997) *Mineralogy and Petrology* **59**, 143-164. [3] Spry & Thieben (2000) *Mineralogical Magazine* **64**, 31-42. [4] Chen & Dutrizac (1996) *Canadian Metallurgical Quarterly* **35**, 337-351.