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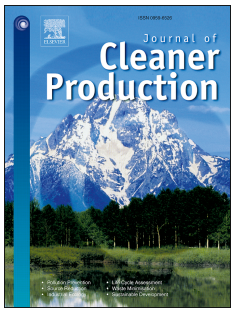

Thermodynamics data of valuable elements relevant to e-waste processing through primary and secondary copper production – a review

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Thermodynamics data of valuable elements relevant to e-waste processing through primary and secondary copper production – a review

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Abstract

Waste of electronics and electrical equipment (WEEE or e-waste) can be viewed as a resource for metals, as it does not only contain the common metals like iron (Fe), aluminium (Al), lead (Pb) and copper (Cu) but also traces of precious and rare elements such as gold (Au), silver (Ag), tin (Sn), selenium (Se), tellurium (Te), platinum (Pt), palladium (Pd), tantalum (Ta), cobalt (Co) and indium (In). The recovery of these trace elements is vital, not just because it has high commercial values, but also for resources efficiency. One of the existing industrial routes for processing of e-waste is through the primary and secondary Cu smelting processes. During these processes, the trace elements are distributed in different phases, i.e. in metal/matte, slag and gas. Different elements have different thermodynamic properties that govern the partitioning behaviour during the process. There has been a number of studies on the distribution behaviour of the trace elements relevant to primary Cu smelting (extraction of metals from virgin ores). However, there are only limited thermodynamics data relevant to secondary Cu smelting (extraction of metals from secondary/recycled sources). This paper reviews the thermodynamics data relevant for recovering the trace valuable elements from the primary Cu as well as secondary Cu smelting. These data and knowledge provide the basis for determining the optimum conditions favourable for recovering the trace valuable elements in e-waste through the industrial Cu pyrometallurgical processing.

Keywords: **Thermodynamics, Precious metals distribution, Valuable metals distribution, Black Copper Smelting, E-waste recycling, WEEE recycling**