

# Phase Analytical Studies of Industrial Copper Mattes

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The pyrometallurgical extraction of copper from sulfide ore concentrates is determined by the behavior of the associated iron. Thus,  $^{57}\text{Fe}$  Mössbauer spectroscopy is an attractive tool for studying the physical chemistry of the process. Other methods used for phase analysis were ore microscopy, electron microprobe analysis, and X-ray powder diffractometry.

The present study involves an examination of the feed and intermediates (mattes) of industrial copper smelting processes in Germany and Chile. In this context, Mössbauer spectroscopy can be used to distinguish the iron containing species present, providing a semiquantitative estimate of their relative abundances. Unusual copper iron sulfide phases could be detected in the mattes produced by Outokumpu flash and reverberatory smelting. Low temperature Mössbauer measurements have been used to investigate the magnetic structure of these phases. Additionally, a troilite-like iron sulfide phase was found in the reverberatory furnace matte. The subspectrum had to be fitted by considering the full Hamiltonian. The occurrence of nearly stoichiometric FeS is unusual because it is normally found only in meteorites. The alterations brought about as the specimens are heated under controlled conditions need to be studied in order to find out how the microscopic structures of the mattes were formed.