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Microstructures and properties of sintered Cu–MoS₂/Cu functional gradient materials

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ABSTRACT

The Cu–MoS₂/Cu functional gradient material was prepared by powder metallurgy method. The effects of MoS₂ content on the microstructure, phase composition, and wear performance were analyzed. Solid–solid phase reaction occurred between MoS₂ and Cu in the sintering process. The reaction products are complex copper–molybdenum sulfur compounds, copper sulfide, and Mo, and they distributed in the matrix grain boundary. The transition layer existed in the Cu–MoS₂/Cu gradient materials. With the increased content of MoS₂, the amount of solid–solid phase reaction products increased; the density, electrical conductivity, and tensile strength of the materials decreased; and the hardness and the thickness of the solid lubrication film increased. When the content of MoS₂ was 3%, the electrical conductivity and mechanical properties have a good combination, and wear performance of the composite materials are the best.

KEYWORDS: Cu–MoS₂/Cu functionally graded materials, self-lubricating, microstructure, properties