

Microstructure–Tribology Relationships in ZnO–MoS₂ Composites Consolidated by Advanced Sintering Techniques

ZnO-based ceramics are promising candidates for functional and wear-resistant components due to their combined electrical, optical, and tribological properties. In this work, ZnO composites containing 2.5 wt.% MoS₂ were consolidated using three distinct sintering routes: Microwave Sintering (MW), Spark Plasma Sintering (SPS), and the Cold Sintering Process (CSP), in order to establish how each densification mechanism governs microstructural development and, consequently, tribological behavior. Particular attention was given to the role of grain size, porosity distribution, and phase dispersion in enabling self-lubricating responses. Microstructural characterization by FESEM, together with density measurements, revealed marked differences among the three techniques, with variations in grain growth kinetics and residual porosity linked to the heating mode and processing parameters. These microstructural changes are expected to directly affect wear mechanisms and frictional performance by modifying contact conditions, load-bearing capacity, and the formation of lubricating tribofilms associated with MoS₂. Overall, the results demonstrate that tailoring the sintering route provides an effective pathway to engineer ZnO–MoS₂ composites with microstructures optimized for improved tribological functionality.

Professional Status of the Speaker

Doctoral or Master Student

Interest in submitting a paper in a special issue of

Journal of the European Ceramic Society (Elsevier)

Invitation letter for visa

No

Authors: Mrs BONILLA MOLINA, ASHLEY (Instituto Universitario de Tecnología de Materiales, Universitat Politècnica de València - Spain); Dr BORRELL, Amparo (Instituto Universitario de Tecnología de Materiales, Universitat Politècnica de València - Spain); Dr MORMENEO, Andrés (Instituto Universitario de Tecnología de Materiales, Universitat Politècnica de València - Spain); Dr ELISSALDE, Catherine (Univ. Bordeaux, CNRS, Bordeaux INP, ICMCB, UMR-5026, France.); Dr MORENO, Rodrigo (Instituto de Cerámica y Vidrio, Consejo Superior de Investigaciones Científicas, Spain); Dr CHUNG, U-Chan (Univ. Bordeaux, CNRS, Bordeaux INP, ICMCB, UMR-5026, France.)

Presenter: Mrs BONILLA MOLINA, ASHLEY (Instituto Universitario de Tecnología de Materiales, Universitat Politècnica de València - Spain)

Session Classification: Microstructure evolution during sintering and Microstructure-property relationships

Track Classification: Group 1: Microstructure evolution during sintering and Microstructure-property relationships