

UNIVERSITY OF BELGRADE  
TECHNICAL FACULTY IN BOR



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## STUDIES OF THE INFLUENCE OF GRAPHENE NANOSHEETS ON THE WETTABILITY OF LEAD-FREE SOLDER ALLOYS

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**Mentors: Srba Mladenović, Jasmina Petrović**

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### Abstract

Research and studies on solders were done by many researchers in the hope of developing sustainable lead-free solders. Solders are often made of low melting point alloys since melting is a need for the soldering procedures. The most common solders are Pb-Sn alloys, and research into their characteristics is significant. Unfortunately, lead and its compounds have a harmful influence on both the environment and human health.

This paper presents an overview of research on composite solders based on tin (Sn) reinforced with graphene. Graphene was used in the form of graphene nanosheets (GNSs) with different weight content, and the composite was produced by the powder metallurgy method. The variable mass content of GNS was successfully pressed into lead-free solder using a high-planetary ball mill. This method enabled better homogeneous mixing and consolidation of the powder. After that, the powder that was obtained was sintered. The assumption was that the role of the GNS particles was to improve the mechanical and physical properties of the solder alloys.

Wettability tests were performed on several tin alloys reinforced with GNS, and the results were practically similar. The presence of GNS reduces the interfacial tension between the solder and the surface. As a result, the contact angle decreases, and the wettability of the composite solder increases. Based on past research and a review of the literature, it is possible to conclude that the wettability of lead-free solder alloys reinforced with GNS improves.

**Keywords:** *Graphene nanosheets, High-planetary ball mill, Sintering*

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