Komitet za termodinamiku i fazne dijagrame Srbije

u saradnji sa:

Fakultetom tehničkih nauka u Kosovskoj Mitrovici,
Tehničkim fakultetom u Boru i
Associated Phase Diagram and Thermodynamics Committee
(Poland, Czech Republic, Hungary, Bulgaria, Slovenia, Serbia, Montenegro, Romania, Croatia, Bosnia and Herzegovina)

JEDANAESTI SIMPOZIJUM O TERMODINAMICI I FAZNIM DIJAGRAMIMA

sa međunarodnim učešćem

ZBORNIK IZVODA RADOVA

Kosovska Mitrovica,
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Jedanaesti simpozijum o termodinamici i faznim dijagramima

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Jedanaesti simpozijum o termodinamici i faznim dijagramima

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Sadržaj

Plenarno predavanje:

Izvodi radova:

The effect of thermal aspects and composition on the melting process in various commercial solder alloys

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Abstract

The melting process in commercial solder alloys is a crucial aspect of soldering applications and plays a significant role in determining the quality and reliability of solder joints. Traditional Sn-Pb solder has been popular for many years in the electronics industry due to its low cost and superior properties (excellent mechanical, wettability, and thermal properties). However, due to health and environmental concerns, the lead used was banned and new Sn-based solder alloys near eutectic or ternary alloys were developed to replace the Sn-Pb solder. The composition of solder alloys plays a vital role in their melting process. Commercial solder alloys typically consist of a combination of tin (Sn), lead (Pb), silver (Ag), and other alloying elements. The choice of alloy composition can affect the melting temperature, solidification behavior, and mechanical properties of the solder. The addition of alloying elements, such as silver, can lower the melting temperature, increase wetting properties, and improve the mechanical strength of the solder joint [1-5].

The presented work shows the results of DSC (differential scanning calorimetry) measurement for commercial Sn-based solders whose chemical composition is shown in the table. Chemical composition was analyzed using the XRF method. Test samples for DSC measurement were randomly selected and cut from solder alloys. The mass of the sample was about 5-10 mg. After that, the samples were heated from 30°C to 300°C with a heating rate of 10°C/min in a protected nitrogen atmosphere.

The obtained results of DSC measurements are in agreement with the literature data of the phase diagrams of used solders. Considering thermal aspects and composition, engineers and researchers can make decisions regarding the selection and processing of solder alloys for specific applications.

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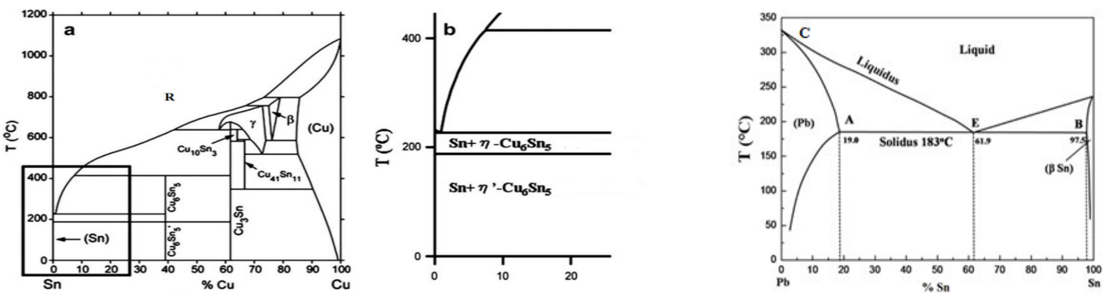
Graphical abstract:

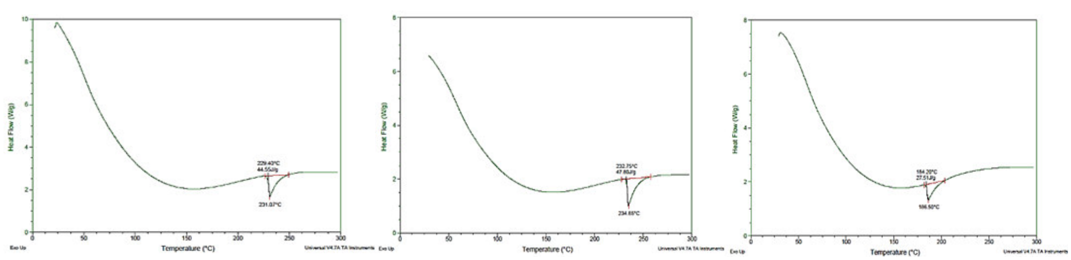
Chemical composition of investigated solder alloys in wt%.

	Sn	Cu	Pb	Al	S	Si
Sample 1	96.27	2.5	0.03	0.7	0.3	0.2
Sample 2	98.97	/	0.07	0.5	0.4	0.06
Sample 3	61	/	21.4	2.9	8.1	6.6



a) b) c)

a) phase diagram Sn–Cu, b) magnification of the Sn-rich corner and c) phase diagram Pb – Sn.



a) b) c)

DSC curves of investigated Sn-based solder alloys: a) sample 1, b) sample 2 and c) sample 3.