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)

DVANAESTI SIMPOZIJUM O TERMODINAMICI I FAZNIM DIJAGRAMIMA

sa međunarodnim učešćem

ZBORNIK IZVODA RADOVA

Kosovska Mitrovica,
20-21. jun 2025. god.

Dvanaesti simpozijum o termodinamici i faznim dijagramima

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Dvanaesti simpozijum o termodinamici i faznim dijagramima

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Recenzentski odbor

Sadržaj

Plenarno predavanje:

Izvodi radova:

Thermal properties of eutectic Sn-0.7Cu alloy reinforced with graphene nanosheets produced by powder metallurgy technique

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Abstract
In this research, the effect of graphene nanosheets (GNS) on the thermal conductivity of Sn-0.7Cu-xGNS (x= 0, 0.02, 0.04, 0.06, 0.08 and 0.1 wt.%) nanocomposite materials was investigated. The GNS were successfully incorporated into the matrix alloy using the powder metallurgy technique, which includes mixing and mechanical alloying, cold compacting and sintering. Thermal diffusivity was measured at room temperature in an inert protective atmosphere using the xenon-flash method. The Sn-0.7Cu matrix alloy has a thermal conductivity of 53 $Wm^{-1}K^{-1}$ [1], while GNS exhibit a significantly higher value of 5000 $Wm^{-1}K^{-1}$ [2]. Therefore, it can be predicted that adding GNS will enhance thermal conductivity. However, the situation becomes more complex with composite materials [3]. The obtained value for thermal conductivity of the matrix alloy is 28.42 $Wm^{-1}K^{-1}$, while the composite with a 0.08 %GNS has the highest thermal conductivity of 35.29 $Wm^{-1}K^{-1}$. However, as the GNS content further increases, the thermal conductivity decreases. The decrease in thermal conductivity can be attributed to the agglomeration of GNS along the grain boundaries. This agglomeration leads to the accumulation of dislocations, which distort the matrix lattice, increasing the probability of electron scattering. As a result, the number of effective electrons (as heat carriers) in the crystal is reduced, which raises resistance and decreases thermal conductivity. The results indicated that the incorporated GNS enhanced the thermal conductivity of the matrix alloy to a certain extent.
Type of work: original research paper.

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2. A. A. Balandin, S. Ghosh, W. Bao, I. Calizo, D. Teweldebrhan, F. Miao, C. N. Lau, Nano letters, 8(3) (2008) 902-907.
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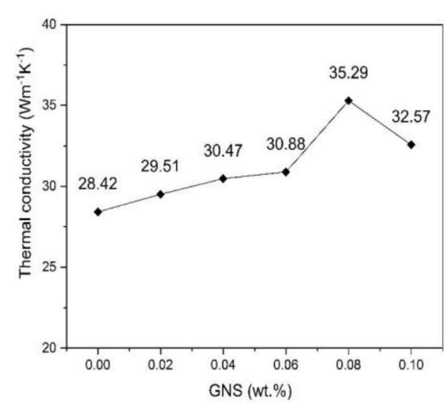
Graphical abstract:

Thermal diffusivity, specific heat capacity, and thermal conductivity of the Sn-0.7Cu-xGNS nanocomposite materials.

Nanocomposite materials	Thermal diffusivity (mm^2s^{-1})	Specific heat capacity ($Jg^{-1}K^{-1}$)	Thermal conductivity ($Wm^{-1}K^{-1}$)
Sn-0.7Cu	15.69	0.254	28.42
Sn-0.7Cu/0.02GNS	17.03	0.244	29.51
Sn-0.7Cu/0.04GNS	17.27	0.250	30.47
Sn-0.7Cu/0.06GNS	17.93	0.245	30.88
Sn-0.7Cu/0.08GNS	20.03	0.251	35.29
Sn-0.7Cu/0.10GNS	19.35	0.245	32.57



Thermal conductivity of Sn-0.7Cu-xGNS nanocomposite materials.