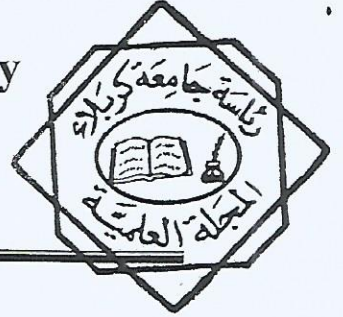


Lower Melting-Point Lead-Free Solder Alloy

درجة ذوبان اقل لسبيكة اللحام – خالية من عنصر الرصاص

Tarik T.Issa ,Farah T.Mohamed ,Nadia A.Ali

University of Baghdad, College of Science , Physics Department



Abstract:-

A lower –melting – point solder alloy composition $\text{Sn}_{42}\text{-Bi}_{57.3}\text{-Zn}_{0.7}$ has been studied by Differential Scanning Calorimetric (DSC), a large portion of the alloy melts sharply at a approximately 136°C , the melting point of Sn-Bi , Sn- Zn eutectic alloy .The produce alloy was analyzed by XRD and optical microscopy for microstructure characterization .The hardness of alloy has been tested and was found of a value 10HRB as a ductile form .

الخلاصة :-

اقل درجة ذوبان لسبيكة اللحام ذات التركيب (قصدير 42 –بزموت 0.7 57-زنك 0.7) نسبة مئوية وزنية تم دراستها بواسطة المسح المسعري التفاضلي .اغلب السبيكة المحضرة ذابت وبشكل حاد عند درجة حرارة 136°C درجة سليزية لسبيكة قصدير –بزموت ، قصدير-زنك التوصيلية . السبيكة المحضرة حلل تركيبها الدقيق بواسطة حيود الاشعة السينية والمجهز الضوئي فحص الصلادة وجد مقدارة (10) بمقياس برنل لتركيب مرن .

Introduction :-

Significant manufacturing cost reductions can be realized with lower- temperature melting and lead-free solder alloy .According to the European Union Waste Electrical and Electronic Equipment Directive (WEEE) and Restriction at Hazardous Substances , Directive (ROHS),lead had to be eliminated from electronic systems by July 1,2006 [1].More over the lead –alloy of eutectic Sn-Pb solder yield problems during surface mount assembly .In order to alleviate these problems there is a push to lower peak reflow temperature during the soldering process [2].The most common alloy used in reflow soldering is eutectic Sn-37Pb of a melting point 183°C [3]. Alternative solder alloys with lower melting points than these of eutectic Sn-37Pb has been developed and often considered for many applications[4].

The alternative alloy most frequently considered Sn-Bi-Ag ,Sn-Bi, Sn-Bi-Cu and Sn-In .The properties of lead-free solders are not thoroughly known and may there for be considered less reliable in select applications, e.g. Hi-rel aerospace, military aerospace –satellite and life –critical medical applications .

The aim of this work was to determine a ternary Sn-Bi-Zn alloy that not only melted at least (40°C) below that eutectic Sn-37Pb , but also free of the -137°C melting phases and had a narrow range of melting - (10°C) with homogenous microstructure good hardness and cheaper monufacturing coast .

Experimental Procedure :

The samples used in this work were melted from pure elements(99.9 wt%)in a resistance furnace under inert atmosphere (obtained by a constant flow of Argon), and casted in alumina boat.

Two alloys were prepared for sake of comparison with its properties obtained in the studied systems. The differential scanning calorimetric (DSC) for the alloys was detected upon heating at scanning of $5^\circ\text{C}/\text{min}$ to determine the heat extraction that is conducting the onset melting point. The alloy was exanimate by XRD (Philips vertical powder diffractometer type PW1050 was used. Spectra were obtained by using Ni filtered $\text{Cu}\alpha$ radiation $\lambda =0.15418\text{ nm}$ operated at 40kV and