中国有色金属学报
中国有色金属学报(英文版)
中国科学技术协会 主管
中国有色金属学会 主办

论文摘要

中国有色金属学报
ZHONGGUO YOUSEJINSHUXUEBAO XUEBAO
第17卷　第3期　(总第96期)　2007年3月

[PDF全文下载]

文章编号：1004-0609(2007)03-0390-06

添加0.10%Ce对Sn-0.7Cu-0.5Ni焊料与Cu基板间界面IMC的影响

卢　斌，王娟辉，栗　慧，朱华伟，焦宪贺

(中南大学 材料科学与工程学院，长沙 410083)

摘　要：研究Sn-0.7Cu-0.5Ni-*x*Ce(*x*=0，0.1)焊料与铜基板间543 K钎焊以及453 K恒温时效对界面金属间化合物(IMC)的形成与生长行为的影响。结果表明：往Sn-0.7Cu-0.5Ni焊料合金中添加0.10%Ce，能抑制等温时效过程中界面IMC的形成与生长；焊点最初形成的界面IMC为Cu_6Sn_5，时效10 d后，Sn-0.7Cu-0.5Ni和Sn-0.7Cu-0.5Ni-0.10Ce这2种焊料中均有Cu_3Sn形成，与Sn-0.7Cu-0.5Ni/Cu焊点相比，Sn-0.7Cu-0.5Ni-0.10Ce/Cu界面IMC层较为平整；该界面IMC的形成与生长均受扩散控制，主要取决于Cu原子的扩散，添加稀土元素Ce能抑制Cu原子的扩散，Sn-0.7Cu-0.5Ni和Sn-0.7Cu-0.5Ni-0.10Ce焊点界面IMC层的生长速率分别为6.15×10^{-18}和5.38×10^{-18} m^2/s。

关键字：无铅焊料；界面反应；等温时效；IMC；生长率

Effect of 0.10% Ce on intermetallic compounds at Sn-0.7Cu-0.5Ni/Cu interface

LU Bin, WANG Juan-hui, LI Hui, ZHU Hua-wei, JIAO Xian-he

(School of Materials Science and Engineering,Central South University, Changsha 410083, China)

Abstract: Intermetallic compound(IMC) formation and growth of Sn-0.7Cu-0.5Ni solder with addition 0.1% Ce were studied for Cu-substrate during soldering at 543 K and isothermal aging at 453 K. The results show that addition of 0.1% Ce into Sn-0.7Cu-0.5Ni solder inhibits the excessive formation and growth of intermetallic compounds during the soldering reaction and thereafter under aging condition. The intermetallic compound layer formed firstly at the interface is Cu6Sn5, after 10 d of aging a thin Cu3Sn layer is also observed for both solders. After several days of aging, Sn-0.7Cu-0.5Ni-0.1Ce solder gives comparatively planar intermetallic layer at the solder-substrate interface than Sn-0.7Cu-0.5Ni solder. The formation of intermetallic compounds during aging for both solders follows the diffusion control mechanism. Intermetallic growth rate constants for Sn-0.7Cu-0.5Ni and Sn-0.7Cu-0.5Ni-0.1Ce solder are 6.15×10−18 and 5.38×10−18 m2/s, respectively, which has significant effect on the growth behavior of intermetallic compounds during aging.

Key words: lead-free solder; interfacial reaction; isothermal aging； IMC; growth rate

版权所有：《中国有色金属学报》编辑部

地 址：湖南省长沙市岳麓山中南大学内　　邮编： 410083

电 话： 0731-8876765，8877197, 8830410　　传真： 0731-8877197

电子邮箱： f-ysxb@mail.csu.edu.cn