Crystallographic Analysis of Cu-Al Interconnect Intermetallic Compound in an Annealed Micro-Chip

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Abstract

Cu-Al intermetallic compound (IMC) in Cu wire-Al bond pad interconnect interface is drawing attention of researches. However, due to thin IMC thickness, the characterizations of the IMC are limited to expensive and time consuming techniques. An evaluation is performed to use common X-Ray Diffraction (XRD) technique to identify the IMC in the Cu wired micro-chip samples in powder form. The attempt of analyzing the IMC using common XRD technique in θ/2θ geometry configuration is demonstrated. Diffractogram from powder sample shows a peak that corresponds to CuAl phase only when it is configured to slow scan for specific 2θ range. This is due to low composition ratio of Cu-Al IMC relative to other materials. Existence of mixture of CuAl and $CuAl_2$ was first confirmed by transmission electron microscope (TEM) and energy dispersive X-ray (EDX). In XRD analysis, peak correspond to CuAl phase is identified from measurement with slower scan configuration. The difficulty for IMC peak detection in diffractogram is due to low composition ratio of IMC relative to other materials available in the sample. KOH treatment for enhancing IMC peaks intensity does not work as expected as it etches the IMC as well.

Image

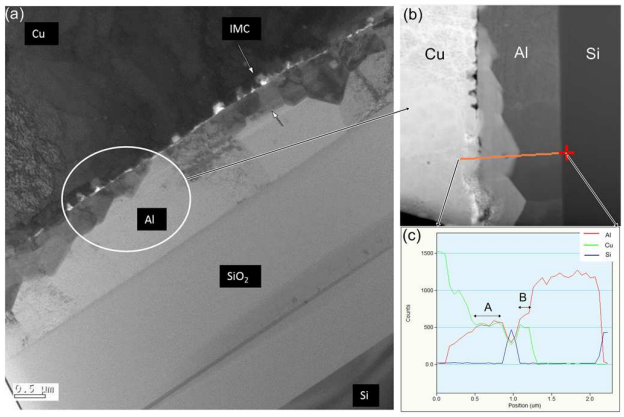


Figure 1: a) TEM image of lamella extracted from center of Cu-Al bonding interface. b) line scan EDX across Cu to Si. c) Signal intensity for Al, Cu and Si elements acorss the line defined in (b).

Recent Publications (minimum 5)

01. Statistical Analysis on the Mechanical and Micro-Structural Characteristics of Thermosonic Cu-Al Interconnection, K.Y. Chua, **T.J.S. Anand**, S. Shariza, Y. F. Khong, C.C. Lee, A.R.M. Warikh, K.T. Lau, B. H. Lim, Ranjit, R.T.R. Kumar, Microelectronics Reliability (Elsevier) Vol. 109 **(2020)** 113664.

02. Xyloglucan-co-MAAc/HAp/SiO_2 bioactive scaffold for bone tissue engineering applications: Physicochemical characterization and in vitro evaluation, Rashid Amin, Muhammad Umar Aslam Khan, Hassan Mehboob, Saiful Izwan Abd Razak, Mohd Yazid Yahya, Abdul Halim Mohd Yusof, Muhammad Hanif Ramlee, **T. Joseph Sahaya Anand**, Rozita Hassan, Athar Aziz, polymers-788971, MDPI Publishing, (Scopus / ISI Index) Vol. 12 (**2020**) 1238.

03. Recent Advances in Biopolymeric composite materials for tissue engineering and regenerative medicines: A review, Rashid Amin, Muhammad Umar, Saiful Izwan Abd Razak, Wafa Shamsan Al-Arjan, Samina Nazir, **T. Joseph Sahaya Anand**, Hassan Mehboob, **Molecules**, MDPI Publishing, (Scopus / ISI Index) **2021** Vol 26, 619.

04. Synthesis and Characterization of silver-coated polymeric scaffolds for bone tissue engineering antibacterial and in vitro evaluation of cytotoxicity and biocompatibility, Khan, Muhammad Umar Aslam ; Razak, Saiful Izwan Abd; Mehboob, Hassan; Abdul Kadir, Mohammed Rafiq; **Sahaya Anand, T. Joseph** ; Inam, Fawad; Shah, Saqlain A ; Abdel-Haliem, Mahmoud; Amin, Rashid **ACS Omega,** Vol. 6 (6), 4335 – 4346, **2021.**

05. Electrospun Nanofiber and Cryogel of Polyvinyl Alcohol Transdermal Patch Containing Diclofenac Sodium: Preparation, Characterization and In Vitro Release Studies, Shafizah Sa'adon, Mohamed Nainar Mohamed Ansari, Saiful Izwan Abd Razak, … Nadirul Hasraf Mat Nayan, **Joseph Sahaya Anand** and Khairul Anuar Mat Amin, Pharmaceutics 13 (11), 1900, **2021**, MDPI Publishing, (Scopus / ISI Index).



T. Joseph Sahaya Anand is an expatriate staff who was born in India on July 30, 1975. As a Physics graduate who completed his UG, PG and M.Phil in Physics from St. Joseph's College, affiliated to Bharathidasan University. He received his Ph.D. in Materials Science from the University of Hong Kong in 2004. Post-doctoral fellowship was awarded by Tohoku University, Sendai Japan during 2004–2005. He is currently Professor of Materials Science in the Faculty of Mechanical and Manufacturing Engineering Technology. His research interests are concerned with materials synthesis and characterization of Transition Metal Chalcogenides and Intermetallic Aluminides for Electronic / Semiconductor Applications. Published about 8 books and numerous high impact publications on reputed Journals. He is an active member of the Institute of Materials Malaysia (IMM), Institute of Physics, Malaysia, Malaysia Solid State Science Forum and Internatioanl Electrochemical Society.



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Notes/Comments: