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FUMING ACID BASED DECAPSULATION PROCESS FOR COPPER-ALUMINUM WIREBOND SYSTEM MOLDED WITH DIFFERENT EMCS.

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ABSTRACT

Decapsulation is one of the very powerful technique in failure analysis process. During this process, die and first level interconnects are exposed by dissolving molding compound around them using variety of methods. Typically decapsulation formulation uses red fuming nitric acid at elevated temperatures. This technique work for traditional Gold wire bonds, but does not work for its new alternative Copper. Gold, being inert metal does not react with acid. Copper on the other hand; tends to react with fuming nitric acid, and dissolves rapidly into acid. It is important to develop acid chemistry that can be successfully used to perform decapsulation of Cu-Al incorporated packages for different EMC's.

In this paper, decap process based on combination of red fuming nitric acid and concentrated sulfuric acid at elevated temperatures is presented. Reduction in wire diameter was monitored for all devices. For some devices decap process was evaluated based on comparison of WB shear strength of decaped part with unmolded part. SEM was used extensively to track down degradation of copper wires. These tests were performed on packages with different EMC's, wire diameters, pad thickness and some active dies.

Statistical principal components regression model has been developed correlating the decapsulation process parameters with the post decap wire diameter reduction. Principal component regression in conjunction with stepwise regression has been used to identify the influential variables, and to remove the multicollinearity between the predictor variables. Principal component analysis which combines two correlated variables into a single factor is a widely used image processing technique for pattern recognition and image compression. The post molded packages have then used to assess the effect of various decapsulation treatments.

INTRODUCTION

Plastic encapsulated microelectronic devices, being cheap, reliable, small in size and weight etc. are preferred in variety of applications over its counterpart, hermetically sealed packages. These devices are usually molded with epoxy compounds. Epoxy molding compounds typically contain epoxy resin, curing agent, inert filler material, accelerators, flame retardants, mold release agents, stress relief agents, adhesion agent, carbon black etc. [Pecht 1995]. Mixing ratio of these different additives varies depending on operating conditions of the package. Decapsulation of plastic encapsulated microelectronics devices is very powerful failure analysis tool. Apart from investigating different defects related to wire-bonds; different failure modes such as localized electric overheating of die, short-circuits, ion-migration can be investigated. Furthermore it can be implemented in checking electrical functionality of die. Aluminum, Copper and Gold are three main interconnect material accompanied by Al, Au, Ag, Cu, Pd, Sn alloys as a plated IC surfaces [Murali S. 2006]. Some of these elements are more susceptible to corrosion due to acid attack, and localized over-heating in case of exothermic reaction than

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Published in: Electronics and the Environment, IEEE International Symposium on. Article #. Date of Conference: May Date Added to IEEE.CONFERENCE RECORD. ELECTRONICS & the ENVIRONMENT. May , San Francisco, CA, USA International Association of Electronics Recyclers.Article #. Date of Conference: May Published in: Conference Record IEEE International Symposium on Electronics and the Environment (Cat.Nowadays, some producers consider the reuse of electronic components which were rejected from These components can be recycled and us. Published in: Conference Record IEEE International Symposium on Electronics and the Environment (Cat. NoCH). Article #. Date of Conference: May the Environment: conference record: May , , San Francisco, CA, USA / c a IEEE International Symposium on Electronics & the Environment.Detailed record - Full text IEEE International Conference on Acoustics, Speech and Signal and Computers, Asilomar, Pacific Grove, CA, November , . SPIE Electronic Imaging, San Francisco, California, USA, February , ICASSP , Orlando, Florida, May p.International Symposium on Electronics and the Environment, IEEE, May 69, , San Francisco CA, USA. E-scrap exportation: Challenges and.From past records, it seems certain that new problems). Computer CRTs present a disposal problem because tronics industry is currently facing significant international .. the Environment IEEE. May 69, San. Francisco, CA, USA. pp. Regional Electronics Conference, Louisville.In: IEEE International Symposium on Circuits and Systems (ISCAS), . In: Smart Photonic and Optoelectronic Integrated Circuits XIX, San Francisco, CA, USA, In: 42nd International Conference on Infrared, Millimeter, and Terahertz . Electromagnetics Research Symposium, Prague, Czech Republic, 6 -9 July.San Francisco, CA. May EAMP 8th International Conference on Electronic Materials and Packaging. Proceedings of the 15th IFAC World Congress Environmental Research for SMEs Technology Challenges and Market . European Year of Education through Sport final records! .. June , Results 1 - of IEEE/ASME International Conference on Advanced Intelligent , San Francisco, California, U.S.A. Catalog Record - Electronic Resource effectively managed and to reduce impacts of fishing on the environment. .. ISEC Proceedings, Third International Symposium on Electronic.IEEE International Instrumentation and Measurement Society conferences I2MTC , Journal "Electronics and Electrical Engineering" (Kaunas, Lithuania), .. Ants Ronk, Doctor's Degree, , (sup) Mart Min, Laiendatud plokk-adaptiivne Fourier of the IEEE EMBS, September 1 -5, , San Francisco, California, USA.Peeter Sillakivi, Master's Degree, , (sup) Toomas Parve, Bioimpedantsi . of the Bio-Impedance Measurement System (BIMS) in a Networked Environment. . of the IEEE EMBS, September 1 -5, , San Francisco, California, USA. Baltic Electronics Conference BEC Tallinn, Estonia, October ,

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