Defective Surface Analysis of Aluminum Bonding Pads for Au Wire Bonding

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Abstract: Surface analysis on defective wire-bonding pads are performed in flash memory assembly. Week wire bonding may cause a significant effect on the final product reliability, and the surface condition of the aluminum bond pads is critical in terms of product reliability. To find out possible week bonding on semiconductor interconnects, ball sheer test (BST) has been performed. On some defective or week bonded pads, we have investigated the surface contents, assuming that the week bonding is induced from the surface conditions. AES and XPS are employed for the quantitative surface analysis on defective dies.

Key Words : Wire bonding, Aluminum bonding pad, AES, XPS

1. Introduction

It is well known that aluminum bond pads on semiconductor chip play an important role in the wire bonding reliability and the microelectronics products. *Normal* is defined dies that out-last, and *defective* die is used for the sample that the bonding is not turned out to be fail.

2. Experimental

The AES (Auger Electron Spectroscope) used here was PHI700 AES. The XPS (X-ray Photoelectron Spectroscope) used ESCALAB 210. This both measuring equipments used to know a kind of elements and quantity on surface of Aluminum bonding pad. we have experimented to compare normal die and fault die.

3. Results and Discussion

Figure 1 is analyzed with surface of aluminum bonding pad to utilize at AES. when normal die compared with fault die, amount of O_2 kinetic energy intensity is much fault die than normal die. of course, atomic percentage too. it prove that Oxide is partial remain on aluminum bonding pad. Fig 2 similarly increase intensity of bindng energy of oxygen. A kind of the binding energy of oxygen is Al_2O_3 or SiO_2.

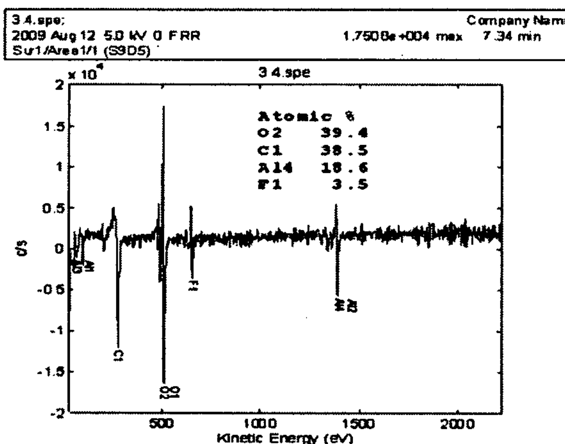

Fig 1. AES analysis of normal die and fault die

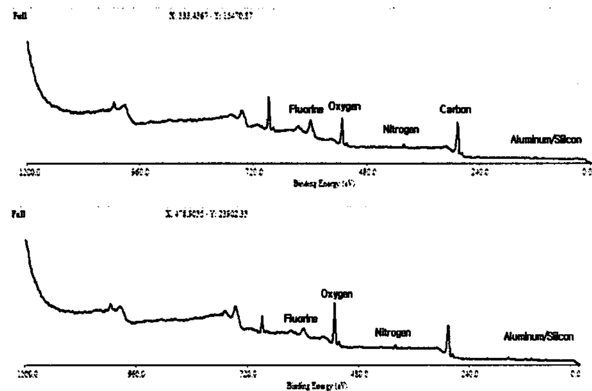

Fig 2. XPS analysis of normal die and fault die

4. Conclusion

The contamination on aluminum bonding pad surface of fault die a lot more than the normal die has been analyzed by Oxygen species. there are two type of Oxygen species. First, Silicon Oxide. It is passivation to protect the external contamination. So, Silicon Oxide is deposited on aluminum bonding pad. To interconnect between aluminum bonding pad and external signal, Silicon Oxide etched on aluminum bonding pad. After the etch process, Here remaining Silicon Oxide is contamination on boding pad. Second, Aluminum Oxide division. It is native oxide layer to expose to external. The two series of oxide is not flat type, a little rugged type remains on aluminum bonding pad.

Reference

[1] Paul Yu, Jamie Su, Qiang Gao, and Ming Li. "Study of Aluminum Pad Contamination Sources during Wafer Fabrication, Shipping, Storage and Assembly," International Symposium on High Density Packaging, pp. 1-3, 2009.

[2] Y.F. Chong, R. Gopalakrishnan, C.F. Tsang, G. Sarkar, S. Lim, and S. Tatti "An investigation on the plasma treatment of integrated circuit bond pads," Microelectronic Reliability, Vol. 40, No. 7, pp. 1199-1206, 2000.

[3] S. Alberici, D. Coulon, P. Joubin, Y. Mignot, L. Oggioni, P.Petruzza, D. Piumi, L. Zanotti "Surface treatment of wire bonding metal pads," Microelectronic Engineering, Vol. 70, No. 2-4, pp. 558-565, 2003.