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**Plasma decapsulation of microchips with silver (Ag) bonding wires**

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Future trends in semiconductor industry aim at 3-dimensional structures and further miniaturization of microchips for improved performance and higher energy efficiency. Amongst other challenges to be met, metals with improved electrical conductivity are indispensable for electrical bonding of the more and more complex microchip structures. Consequently, silver – providing the requested improved electrical conductivity – is increasingly replacing state-of-the-art metals used for electrical bonding.

Plasma decapsulation of microchips for failure analysis has to guarantee minimum damage of both the chip structures and the bonding wires. The Rapid Reactive Radicals Technology (R3T), introduced by the microwave driven Remote Plasma Source (RPS), provides the capability for fast plasma decapsulation of microchips with high selectivity and no attack on metals like gold (Au), aluminum (Al), copper (Cu) and alloys from copper and palladium (Pd) frequently used for conducting paths and bonding wires. The radicals generated by the RPS only produce chemical reactions at the surface of the substrates, leading to pure chemical etching at high rates with extremely low thermal load, thus keeping the effect on the microchip and on the bonding wires as low as possible.

Unlike the above-mentioned metals and alloys frequently used for bonding wires, silver can easily and severely be damaged by radicals generated from oxygen and fluorine compounds. In order to be able to perform plasma decapsulation even of microchips with bonding wires made of silver, the R3T technology of Muegge enables damage free decapsulation introducing different process gases and varying process parameters by focusing on microwave power and chamber pressure. Different process conditions were applied in the tests. The results of this parameter variation that will be presented in this paper finally led to successful decapsulation of the microchip without damaging the silver bonding wires.

**Keywords**

Remote Plasma Source

Plasma Etching

Microwave Plasma

Plasma Decapsulation

Silver Bonding Wires