

Effect of Tape Liftoff Tool Settings and Plasma Conditions on Metal Peeling from Polyimide Surfaces

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ABSTRACT

In this paper we report the effects of peeling angle and roller pressure on metal damage during tape liftoff process. Using automated inspection, we find quantitatively, that proper peeling angle is required to significantly reduce metal damage. DOE data also shows that an optimized roller pressure is crucial for a damage free process. Multi design layouts also play a role and should be checked out thoroughly before process release.

Fig.1 shows roller peeling direction with respect to the die orientation. Repeated tests show when roller peels in the (a) direction, the metal wires have no damage as can be seen in the AOI (automated optical inspection) yield chart shown in Fig 2. However when roller peels in the (b) direction, the wire can be seen peeling from the polyimide surface as seen in Fig.3 causing low AOI yield.

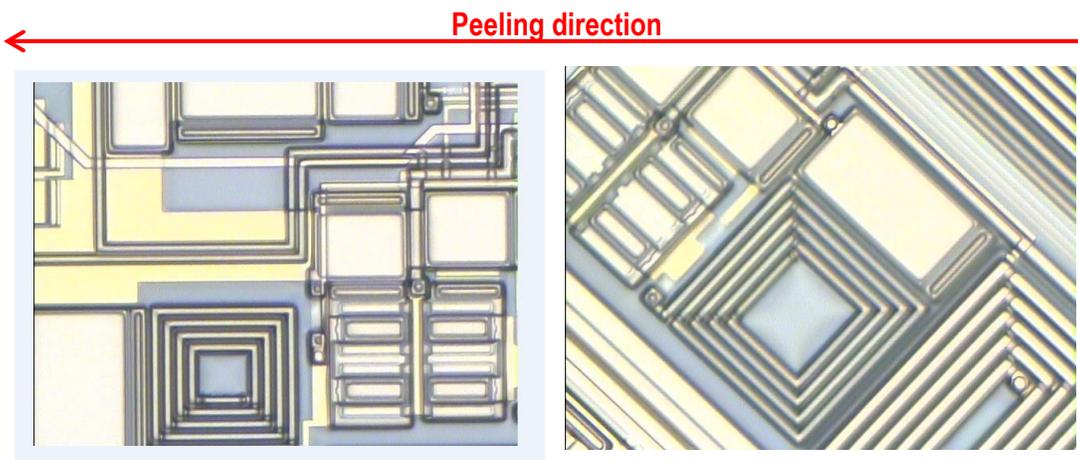


Fig. 1 (a), 0 degree

Fig. 1 (b), 45 degree

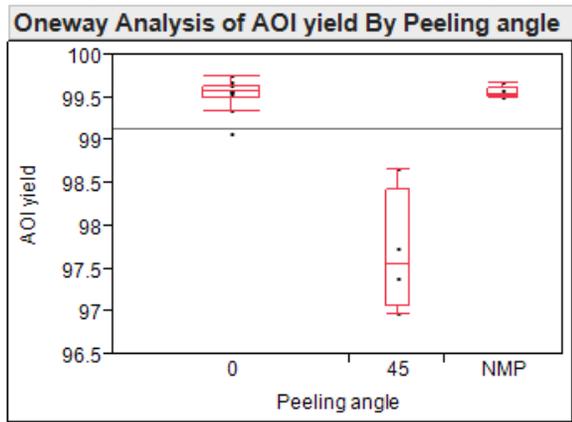


Fig.2 AOI yield for different peeling orientation

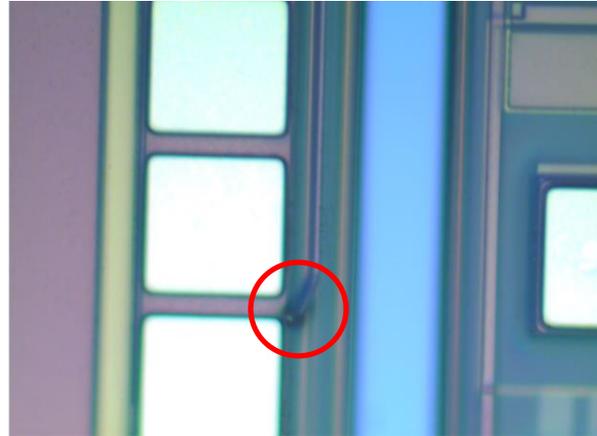


Fig.3 Metal wire is peeling from polyimide surface

This paper will also discuss how oxygen plasma can improve metal adhesion on the polyimide surfaces. This weak adhesion has been studied extensively in many fields including semiconductor industry. Our data shows if proper oxygen plasma is used to modify polyimide surfaces, the metal adhesion can be improved and metal peeling, which otherwise occurs during tape liftoff can be reduced significantly. Fig. 4 shows roller pressure effects on AOI yield. As pressure changes from 0.07 to 0.12 MPa, AOI yield decreases. Fig. 4 also shows when O₂ plasma is used to treat polyimide, the AOI yield becomes very good and comparable to that of the NMP solvent liftoff process.

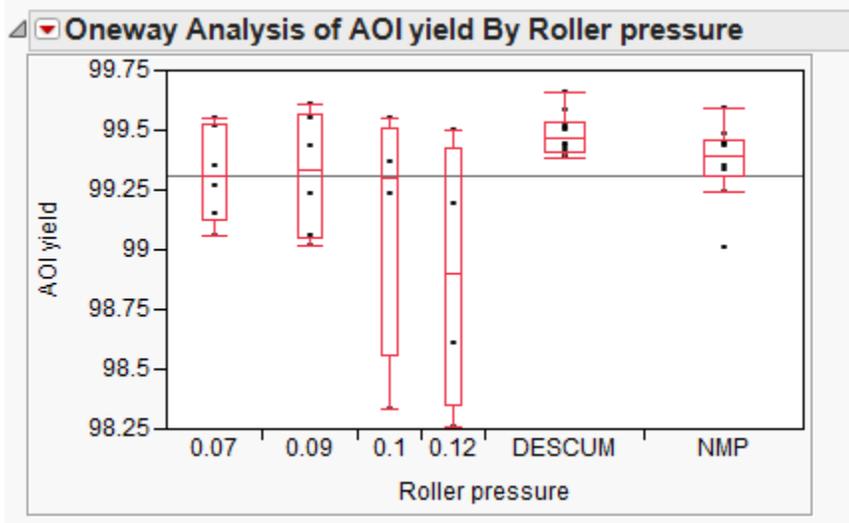


Fig.4 Roller pressure and O₂ plasma effects on AOI yield

Detailed information, including mechanism for adhesion enhancement using plasma treatment, will be presented in the final paper.