

# APPLICATION NOTE

## Determining the mechanical characteristics of gold coatings on conductive traces in printed circuit boards

Nowadays, ever thinner coatings are being used in the electronics industry, not only to save material but also because of rapidly shrinking structure sizes. To reliably determine the mechanical characteristics of, for example, gold coatings with a thickness of only a few hundred nm, a precise and accurate measurement technique is required.

The thin Au coatings used on PCBs must serve various purposes: as corrosion protection, to improve solderability and to protect against wear. For detecting the mechanical characteristics of these thin coatings, such as hardness or elasticity, the instrumented indentation test is a well suited method with the further advantage of avoiding any influence of the substrate on the measurement results.

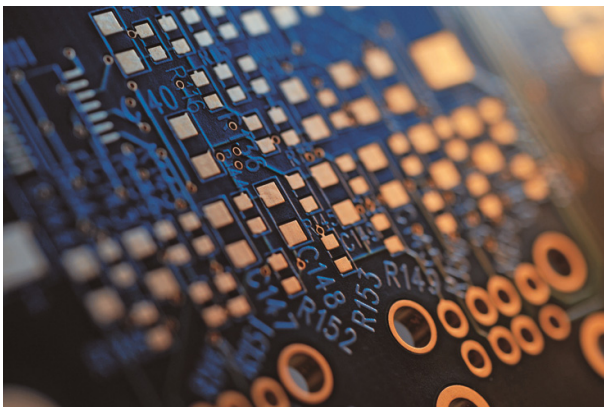


Fig.1: Au-coated printed circuit board

For applications subject to mechanical stress, such as sliding contacts, the mechanical characteristics must exhibit absolutely non-varying parameters.

Figures 2 and 3 show the measurement results of two different gold coatings. Using the instrumented indentation test, a 0.5  $\mu\text{m}$  Au coating was loaded with a test load of 0.2 mN and a 0.2  $\mu\text{m}$  Au coating with a test load of just 0.05 mN.

The FISCHER PICODENTOR<sup>®</sup> HM500 measuring system is designed specifically to handle such small load parameters and travel distances. To better compare the results from the two samples, the time of the test load was adjusted so that the load increase curves both had the same slope.

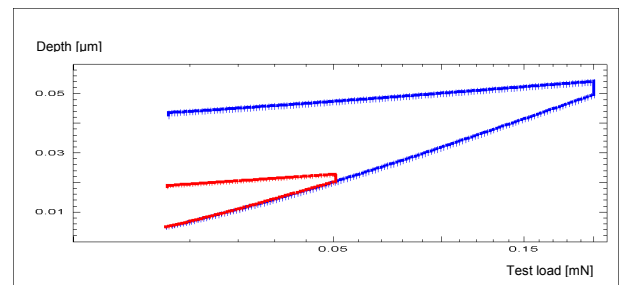


Fig.2: Schematic of a load-displacement curve including standard deviation of a 0.2  $\mu\text{m}$  (red) and a 0.5  $\mu\text{m}$  (blue) Au coating.

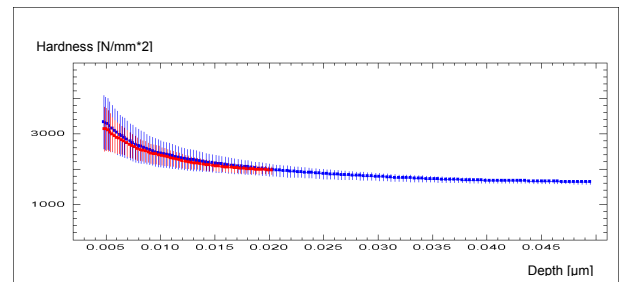


Fig.3: Martens hardness (HM) including standard deviation of a 0.2  $\mu\text{m}$  (red) and a 0.5  $\mu\text{m}$  (blue) Au coating.

Both samples show nearly identical hardness profiles (Fig. 3). Based on the standard deviation (variation coefficient of approx. 5%) one can clearly see how precisely these parameters can be determined, even for such thin coatings.

To precisely and accurately determine critical mechanical characteristics such as hardness and elasticity of even very thin gold coatings, FISCHER's PICODENTOR<sup>®</sup> HM500 is the ideal instrument. For more information please contact your local FISCHER representative.