RhySearch
Das Forschungs- und Innovationszentrum Rheintal

NST

NANO SCRATCH TEST

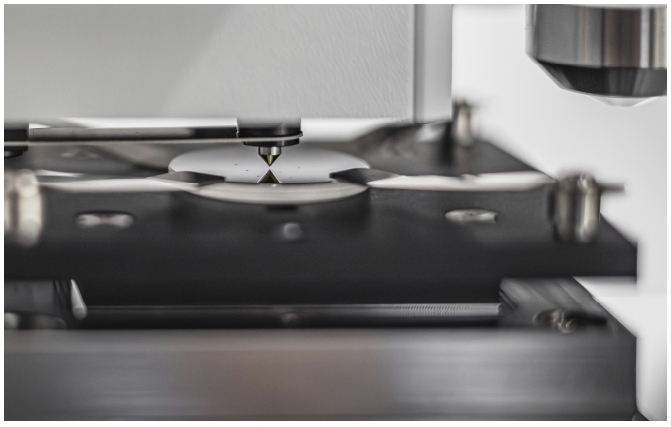
Testing scratch resistance and adhesion properties

The Nano Scratch Test is a valuable technique to examine the scratch resistance, adhesion failure and friction or wear of thin films.

This automated method utilizes an indenter with either a rounded diamond tip or a diamond wedge. This tip touches the film's surface while the sample is moved at a constant speed. During this movement a force is being applied to the surface, which can remain constant, increase linearly or increase gradually. As a result, a scratch track is formed on the surface. Initially, the coating can withstand the small load, but as the force increases, the material eventually fails. This failure leads to characteristic damage patterns, such as cracks, chipping of the coating or substrate fatigue. The evaluation of the test results is conducted using an integrated light microscope. For additional examination the sample can be analyzed with our atomic force microscope (AFM).

The Nano Scratch Test is useful in the development of thin films that require high hardness and demands for wear or scratch resistance. It serves as an excellent method to investigate the adhesion of layers to the substrate or at the interface of different layers. The new diamond blade in particular gives reproducible results about thin coatings while diamond-like tips tend to transfer the applied force into underlying layers.

Additionally, the Nano Scratch Test can be employed for tribological tests, enabling the measurement of friction force and the coefficient of friction.

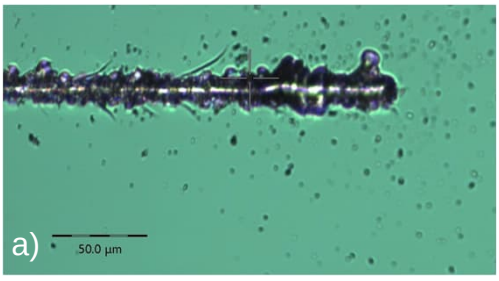


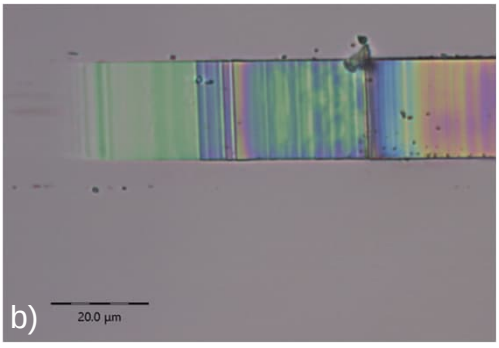
Test conditions
Load range 1-1300 mN

Standard
Based on ISO20502

Indenter tips
Sphero-conical diamond tips
1, 2, 5 and 10 µm

Diamond wedge 20 µm
ideal for film thicknesses <1µm





Characteristic damage patterns obtained from
a) diamond tip and b) 20 µm diamond wedge indenter

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