<u>Topic:</u> Indentation size effect at shallow indentation depths

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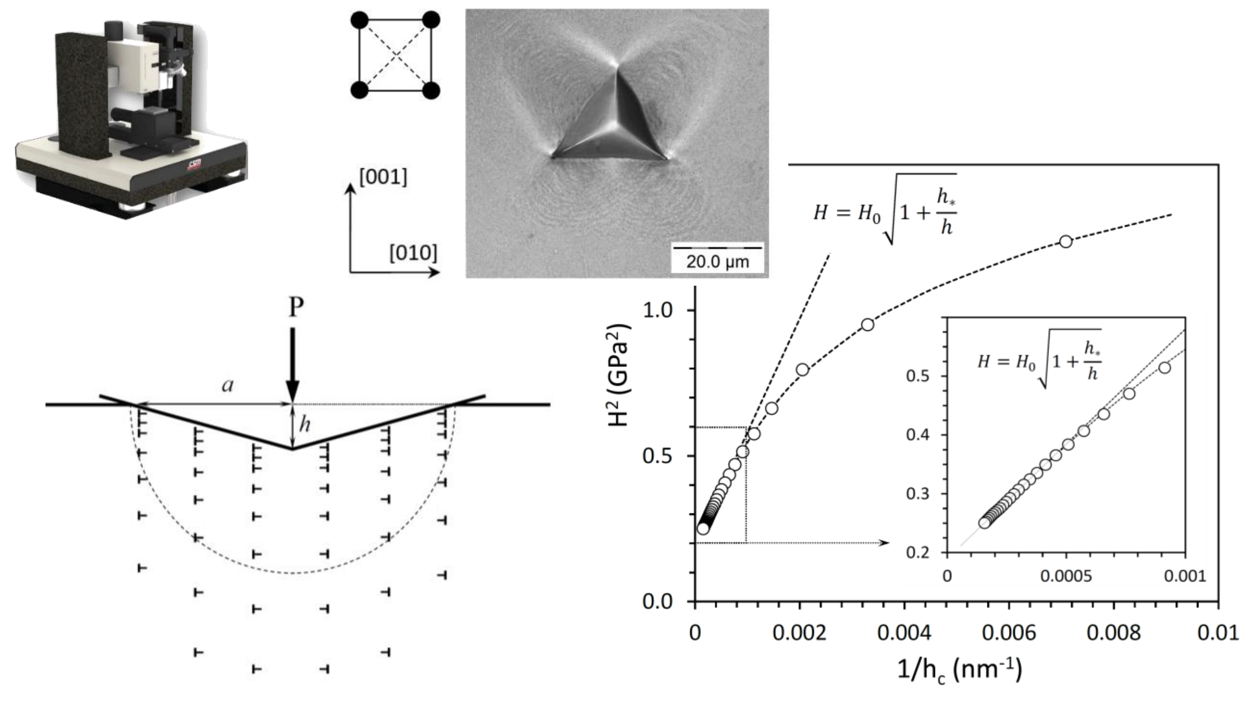
Nanoindentation (instrumented indentation) was developed as an alternative to traditional hardness and microhardness tests based on the penetration of a tip into the material under investigation. The principle of this up-to date method is based on the analysis of force-depth data (the measurements can be easily automatised), it does not require optical analysis of the size of each indentation and due to the small indentation depths (from several nanometres) it is possible to use nanoindentation for the characterisation of very small objects in the material (e.g. individual material phases, micro to nanoscopic particles or thin layers). However, at small indentation depths, the classical relationships between load and size of the indents are no longer valid and the so-called indentation size effect occurs, i.e. an increase in hardness with decreasing indentation depth, which obscures the interpretation of the measured data. It is generally accepted that the indentation size effect is induced by the strain gradient and associated geometrically necessary dislocations in crystalline metals and alloys. However, this phenomenon is still not fully understood and can also occur in glasses, ceramics or polymers. The aim of the project is to understand the indentation size effect, i.e. the mechanisms controlling the effective plastic zone formation and growth during nanoindentation at small loads/shallow indentation depths that are needed for the characterization of e.g. small particles, thin films and coatings, or ion-irradiated surfaces in which the damage is confined to a thin layer.



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