

Investigation of creep behaviour under load during indentation experiments and its influence on hardness and modulus results

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Abstract

To improve the accuracy and comparability of hardness and modulus results from nanoindentation experiments an evaluation of the creep behaviour is required. Creep depends on the material and normally diminishes to very low values within some seconds. Nevertheless, it influences the maximum depth and the upper part of the unloading curve in a way that measurement errors of more than 20% may occur. In this work, a detailed analysis of the creep behaviour for different film and substrate materials is done. In addition, the influence of loading time and hold period at maximum load on the hardness and modulus results is investigated. The results show that especially for materials with low hardness-to-modulus ratio (mostly metals), the modulus results are not reliable if the hold period is chosen too low. Hold periods are proposed in dependence on the material type that should be kept for high accuracy measurements.

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