



The indentation test method for predicting stress–strain relationships of materials based on energy density equivalence

Metoda wyznaczania związku naprężenie-odkształcenie dla materiałów z próby wciskania mikro wgłębnika w oparciu o metodę energetyczną

Zdzisław Nowak¹, Michał Giersig¹

¹*Institute of Fundamental Technological Research, Polish Academy of Sciences, A. Pawńskiego 5B St., 02-106 Warsaw, presenting author: znowak@ippt.pan.pl*

This paper presents an energy-based method to assess the stress-strain characteristics of a material by using nano indentation technique. The model of indentation test with Berkovich tip was initiated by the additionally generated plastic energy that is assumed to be evenly distributed during deformation process, and only requires the load-displacement curves that follow power functions. An explicit equation for estimating the total strain energy which, together with the principle of energy balance in deformation domain, allows us to assess the stress distribution within the contact area between the indenter and material. Overall, the presented nanoindentation testing method provides an efficient way to assess the stress-strain characteristics and fracture properties of a material in micro scale of metals or cement-based, polymer-based and many other nanocomposites.