

Plastic Properties Identification With Plural Sharp Indenters

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An identification method for elastic-plastic material constants that obey the power-law hardening rule, from a couple of instrumented sharp micro-indentation tests, is proposed. Based on a similarity function that is determined from the 3D-FE calculation, it is shown that for plural triangular pyramid indenters with different apex angles, unique values of representative strain correspond to each apex angle. Based on these results, we propose a new method for the material constants determination, utilizing two triangular pyramid indenters with different apex angles. This method allows us to determine the material constants with more stability than with the single indenter method. We also show that the dimensionless function π , which characterizes the relationship between indentation load and Young's modulus of the material, can be expressed as an interpolation between two analytical extremes: the elastic solution and the rigid/perfectly plastic solution. An experimental validation for this method with actual metal is also given.

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