

عنوان مقاله:

Effect of Surface Roughness on Brinell Hardness and Load-Displacement Curves using a Macro Indentation

محل انتشار:

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خلاصه مقاله:

Surface roughness significantly affects the scattering of load-displacement curves and the measurement of mechanical properties by the macro-scale indentation. Many mechanical properties such as modulus of elasticity, yield stress, strain hardening exponent, and hardness can be determined using the indentation results, which are the information obtained from the load-displacement curve. Reliable parameters of the load-displacement (P-h) curve are employed to estimate the mechanical properties. The inaccurate P-h curve leads to a misestimation of material properties. Ignoring the surface roughness might be a source of error in the indentation results. In this paper, the effects of surface roughness on the P-h curve of macro spherical indentation and Brinell hardness number (BHN) were studied. The range of roughness with minimal effect on indentation results was obtained. The surface roughness of ۲ and ۱۲ microns was created on the experimental samples using the electrical discharge machining (EDM) process. The finite element simulations were performed with different surface roughnesses. The results showed that roughness affected both the P-h curve and hardness values in different indentation depths and various indenter sizes. It was observed that with increasing the Rq roughness, the P-h curve level and hardness value decreased and that with increasing the indentation depth, the effect of roughness on hardness decreased as well. The numerical results showed a good agreement with the results of experiments.

کلمات کلیدی:

Macro spherical indentation, Roughness, Brinell hardness, Load-displacement curve, Finite element simulation

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