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Submicron-scale experimental and theoretical analyses of multi-asperity contacts with different roughnesses

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Abstract

The multi-asperity contacts between two nominally flat surfaces were studied experimentally with submicron resolution and compared to the most common elastic-plastic statistical models to provide information that is seriously lacking today. The contact pressure, the real contact area and the asperity deformation were investigated for realistic steel specimens with different roughness in the full engineering loading range up to the material's macro yield stress. The experimental results showed that the roughness strongly affects the real contact area and the deformation behaviour of the asperities. Experimental results and the statistical models shows good agreement for the smoothest surface under all loads, while at loads above $\approx 0.3 \cdot Y$ the models overestimate the real contact area for 2–6 times.

Key Words: *in-situ* experiment; statistical contact models; roughness; real contact area.

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