Direct testing of scale effects in metal forming friction and lubrication

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Downscaling of metal forming operations from macro to micro scale implies significant changes caused by size effects, among these the friction increase, which has been reported by researchers using indirect test methods such as ring-compression test and double-cup-extrusion test. In the present work a new test equipment is developed for direct friction measurements in the range from macro to micro scale. Investigations confirm a significant friction increase when downscaling. Visual inspection of the work pieces show this to be explained by the amount of open and closed lubricant pockets.

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