Short Communication

Fabrication of a Microstructure Array Using Electrochemical Wet Stamping Technique with a Polyacrylamide Gel

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A new micromachining method known as the electrochemical wet stamping technique (E-WETS) is presented in this paper for the fabrication of 3D microstructure arrays on material surfaces. In the E-WETS, a prepatterned polyacrylamide gel template serves as the channel for electrolyte and current flow between the workpiece anode and the tool cathode. The microstructures are fabricated through the limitations of selective anodic dissolution in the contact area between the workpiece and the gel template. Based on the characteristics of the E-WETS, a complete set of micromachining instruments, primarily consisting of a macro-micro positioning stage, are developed. The potential of the short pulse is exploited to increase the precision of the fabricated microstructures. Under the optimized conditions, two complex microstructure arrays are successfully fabricated on a nickel surface. The machining deviations of the two fabricated microstructures from those on the stainless-steel moulds are only 1.02% and 1.12%, respectively. The machining results demonstrate that the E-WETS method is a promising approach for fabricating microstructure arrays with high fidelity and accuracy.

Keywords: Electrochemical wet stamping technique, Microstructure array, Polyacrylamide gel template, Short pulse

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