Electrothermal microgripper with large jaw displacement and integrated force sensors

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Abstract: The novel design of a sensing microgripper based on silicon-polymer electrothermal actuators and piezoresistive force-sensing cantilever beams is presented. The actuator consists of a silicon comb structure with an aluminum heater on top and filled polymer in between the comb fingers. The sensor consists of a silicon cantilever with sensing piezoresistors on top. A microgripper jaw displacement up to 32 ?m at a 4.5-V applied voltage is measured. The maximum average temperature change is 176 ?C. The output voltage of the piezoresistive sensing cantilever is up to 49 mV at the maximum jaw displacement. The measured force sensitivity is up to 1.7 V/N with a corresponding displacement sensitivity of 1.5 kV/m. Minimum detectable displacement of 1 nm and minimum detectable force of 770 nN are estimated. This sensing microgripper can potentially be used in automatic manipulation systems in microassembly and microrobotics. [2008-0064]. ?? 2008 IEEE.

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