

Influence of small slide vibration over Au-Au electric contact phenomenon

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Abstract—A LiNbO₃ piezoelectric bimorph actuator controls the Au-Au contact gap. The control accuracy of the actuator is within the sub-micron range. Contact voltage, contact current, displacement of electrodes and driving voltage of the actuator are continuously and synchronously recorded by an A/D converter and send to a computer. The measured oscillographe data for 1500 contact operation are processed by the computer. Bridge resistance and length can be derived at a contact operation. The diameter of the Au-Au contact bridge is reported to be submicron. We want to examine the influence of small slide vibration over Au-Au electric contact bridge phenomenon. The sub-micron slide vibration was impressed to the fixed electrode and the influence over the contact bridge phenomena were investigated. The bridge length increases and the bridge resistance decreases with the slide vibration amplitude. Using the actuator displacement, the sticking force was estimated by the finite element method. The resonance vibration of bimorph actuator was observed just after the contact bridge break. The motive force of the resonance would be the impulsive force due to the bridge break. Using the impulse model, the resonance vibration of actuator was simulated by the electro mechanical equivalent circuit.

Keywords-electric contact; bridge; sticking; slide vibration; piezo-electric actuator