

## Development of a Novel Circular-Type Piezocomposite Actuator

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### Summary

In this study, we present the optimal design and fabrication process of a circular-type piezocomposite actuator. The interdigitated ring electrode (IRE) system patterned on the PZT wafer surfaces is optimized by using a finite element model. Together with the applied poling voltage, the IRE system determines how many percentage of the ceramic material contributes to the actuation. The objective of the optimization problem is thus to reduce the dead zone and to constrain the breakdown region as well. The optimal design in this study shows much improved performance than other kinds of circular actuator of the same size. Fabrication of this actuator follows a photolithography/etching process. Unlike the NASA RFD<sup>TM</sup>, where the copper-clad IRE systems are cured with the piezoceramic by using an epoxy adhesive coat, the electroded PZT in this study was etched following the optimal designed IRE pattern. This process helps to eliminate the attenuation of the driving electric fields phenomenon occurring in the RFD<sup>TM</sup> actuators due to the unwanted accumulations of epoxy between the electrodes and the ceramic. The applied voltage to this novel actuator is thus lower and it is therefore more efficient in wide applications.

**keywords:** circular-type actuator, piezocomposite actuator, interdigitated ring electrodes

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