

## **Surface Piezoelectricity and Surface Wave Propagation in a Piezoelectric Half-space with Surface Effect**

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### **Summary**

We will report a theory of surface piezoelectricity which governs a plane surface of a piezoelectric body. The piezoelectric surface may be endowed with different properties from the bulk material, and can account for the well-known surface effect which becomes increasingly important in micro- or nano-sized structures. In this study, the surface is treated as a piezoelectric thin layer of thickness  $h$ , and the state-space formalism is adopted to obtain the transfer relation between the state vectors at the top and bottom surfaces of the layer. The power series of the transfer matrix is then used, which can be truncated up to  $O(h^{\hat{\{}}n})$ , with  $n$  being an arbitrary integer. The two-dimensional equations of surface piezoelectricity, which govern the thin layer, are then derived in view of the free boundary conditions. As an example, the theory is employed to study the surface wave propagation in a piezoelectric half-space with surface effect. Results show that the surface effect has a significant influence on the wave dispersion characteristics.

