

Piezoelectricity is a unique effect that certain crystals (called ferroelectrics) can swell or shrink when applied with voltage or vice versa. This effect has for decades found wide applications ranging from telephone speakers to naval sonar. However, the effect is normally very small (mostly in the order of 0.01% change in shape). This paper reports a “colossal” electric field induced shape-change in BaTiO<sub>3</sub> crystal, which is about 40 times larger than conventional piezoelectric effect. Such colossal electro-strain effect may revolutionize many actuator applications. The colossal effect is based on a novel mechanism that utilizes a general symmetry property of point defects to realize reversible switching of domains in ferroelectric crystals, and thus has the potential to create similar colossal effect in a wide range of ferroelectric systems.