Giant Increase in Pyroelectricity Found for Ultrathin Pyroelectrics

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Pyroelectricity results in the generation of an electric voltage when the temperature of a material is changed. It occurs in materials with low symmetry and arises extremely quickly (on a picosecond time scale). It is widely used for thermal imaging, *e.g.*, to spot people with a fever or poorly insulated regions of buildings, for night vision, or in motion detectors.

Various models have been developed to thoroughly describe the origins of pyroelectricity in bulk materials, but despite recent advances in materials simulation a conclusive answer for how this effect scales as pyroelectric materials become ultrathin remains largely unknown.

Here, researchers from RPI **came to PARADIM to characterize three model pyroelectric materials** whose bonding character varies from a van der Waals material (In_2Se_3), to a quasi-van der Waals material ($CsBiNb_2O_7$), to an ionic/covalent material (ZnO). Dimensionality affects all three materials, and an enhancement of the in-plane pyroelectric coefficient by factors of 10-100 is observed in thin sheets over thick ones, with ZnO showing the largest change. The discovery opens a window to using ultrathin pyroelectrics to design and develop high-performance sensing and energy-conversion devices.

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