Physicists discover large-magnitude elasto-optic effect in ferroelectric materials

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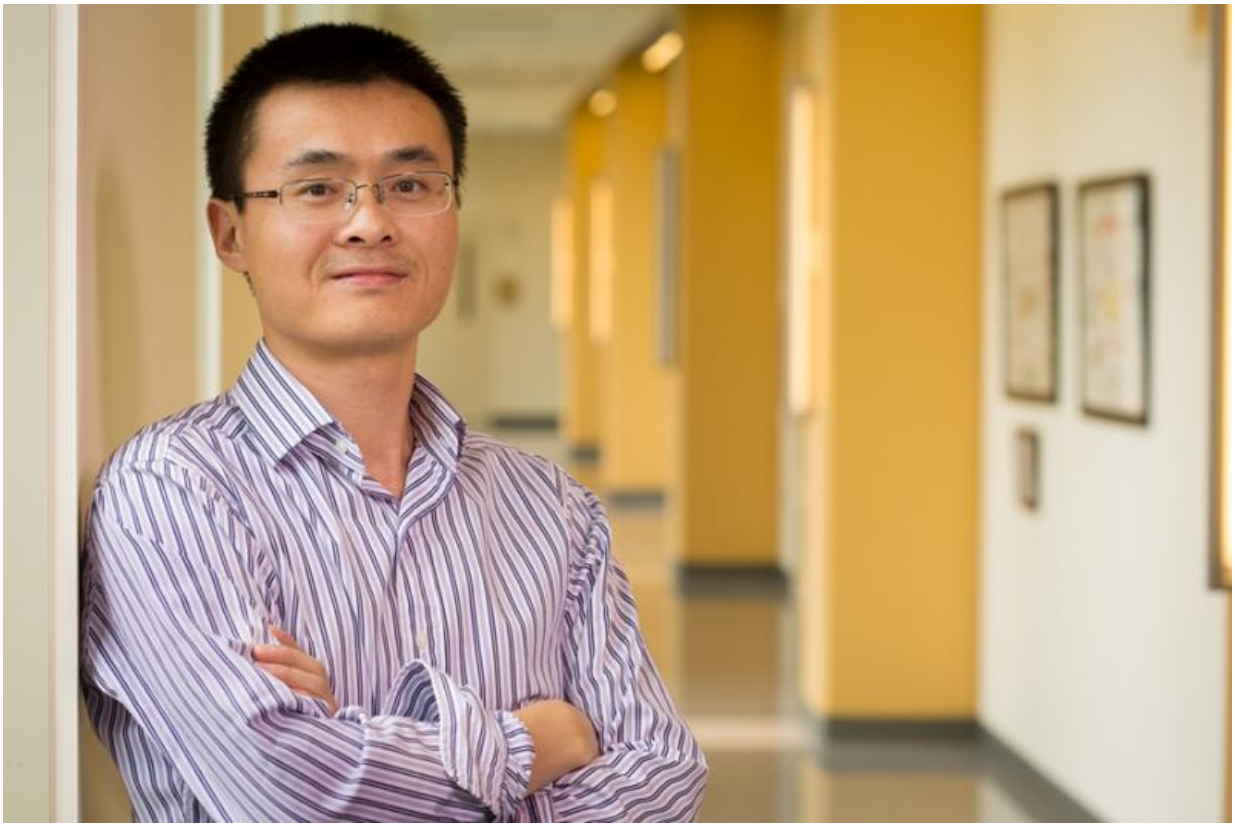

Yurong Yang, University of Arkansas. Credit: Russell Cothren

An international group of physicists discovered a phenomenon of large magnitude in an unexpected class of materials that can lead to a variety of devices used in optical systems.

That phenomenon – the elasto-optic effect – characterizes the formation of a periodic variance of light refraction when an acoustic wave propagates in optical materials, said Yurong Yang, a research assistant professor at the University of Arkansas who led the research.

"We found a significantly large elasto-optic effect in thin films made of materials called ferroelectrics," Yang said, "which are usually considered for their changes in mechanical energy into electrical energy and vice versa, as well in multiferroelectric thin films, which are commonly investigated because of the possible control of their magnetic response by electric input, as well as of their electric response by magnetic input."

The research group published its findings in a paper in *Physical Review Letters*, the journal of the American Physical Society. A second paper describing the research was published in *Nature Communications*, an online journal published by the journal *Nature*.

"Those discoveries of a large elasto-optic effect in ferroelectrics and multiferroelectrics therefore broaden the potential of these materials since they can now be put in use to also control their optical responses by elastic property," said Laurent Bellaiche, Distinguished Professor of physics at the U of A, "which suggests exciting device opportunities arising from this overlooked coupling in these classes of materials."

More information: Lan Chen et al. Large Elasto-Optic Effect in Epitaxial Films , *Physical Review Letters* (2015). DOI: 10.1103/PhysRevLett.115.267602

D. Sando et al. Large elasto-optic effect and reversible electrochromism in multiferroic BiFeO3, *Nature Communications* (2016). DOI: 10.1038/ncomms10718

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