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Nanoultrasonics based on piezoelectric semiconductor nanolayers

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In this presentation, we will review our recent work on the development of nanoultrasonics based on piezoelectric semiconductor nanolayers. Through epitaxial growth of multiple or single piezoelectric semiconductor layers with a period on the order of 10 nm, nanoacoustic waves with a frequency of 1 terahertz and a wavelength of 10 nm can be excited and measured with femtosecond optical pulses. Using temperal coherent and spatial nonlinear optical controls, we are able to synthesize nanoacoustic waveforms and generate a lateral acoustic spot on the order of 100 nm without the need of the near-field optical techniques. In this presentation, we will also discuss the potential use of this terahertz acoustic source for various nanoacoustic applications, including nanoultrasonic imaging.