ErAs/Semiconductor Nanocomposites for 1550nm and 780nm pumped Multicolor Terahertz Emitters

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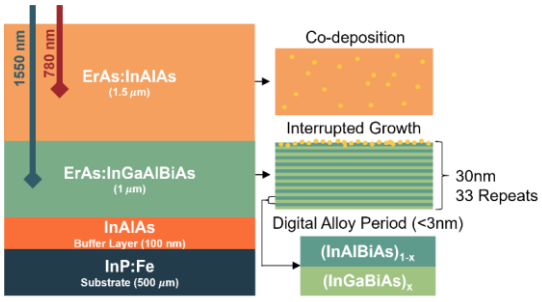

Figure 1: Structural representation of the growth for the Multicolor THz emitter consisting of two films: ErAs:InAlAs (780nm) and ErAs:[$(InGaBiAs)_x(InAlBiAs)_{1-x}$)] (1550nm) presenting the digital alloy period. ErAs nanoparticle incorporation techniques are also shown for their respective films with co-deposition and interrupted growth.

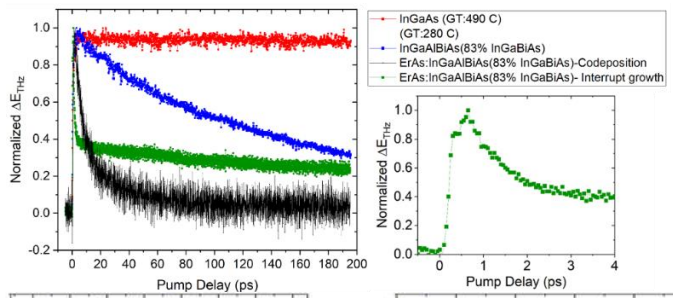

Figure 2: Carrier dynamics measured by Optical Pump (800nm) THz probe spectroscopy demonstrating the fast decay time components in ErAs:InGaAlBiAs materials where sub-picosecond dynamics have been achieved[1]. (GT = Growth Temperature)

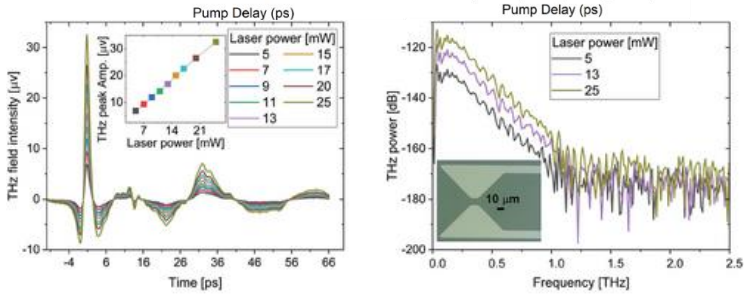

Figure 3: ErAs:InGaAlBiAs detector with fabricated bowtie-shaped photoconductive switch with a 10 μm gap proof of concept results from (a) time domain THz spectroscopy mapping the THz pulse at different laser power levels, and (b) frequency domain, using a fast Fourier-transformed spectrum, showing broadband detection (0.1-1.1 THz) using 1550nm excitation[1].

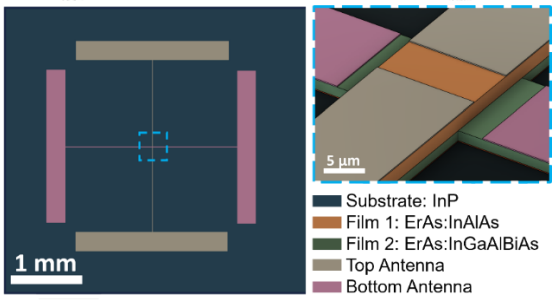

Figure 4: Device schematic of the Multicolor THz emitter. Each film is connected to its own orthogonal photoconductive antenna, allowing for independent biasing and pulse shaping.

[1] W. Acuna, W. Wu, J. Bork, M. F. Doty, M. B. Jungfleisch, L. Gundlach, J. M. O. Zide, Adv. Funct. Mater. **34**, 2401853 (2024).
[2] W. Wu, W. Acuna, Z. Huang, X. Wang, L. Gundlach, M. F. Doty, J. M. O. Zide, M. B. Adv. Optical Mater. **13**, 2402374 (2024).

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