ErAs/Semiconductor Nanocomposites for 1.55 µm-pumped and Hybrid Terahertz Photoconductive Switches

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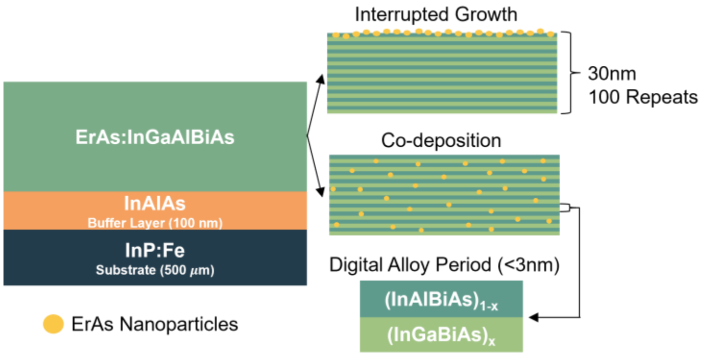

Figure 1: Structural representation of ErAs:[$(InGaBiAs)_x(InAlBiAs)_{1-x}$)] presenting the digital alloy period as well as the difference between co-deposition and interrupted growth techniques to incorporate ErAs.

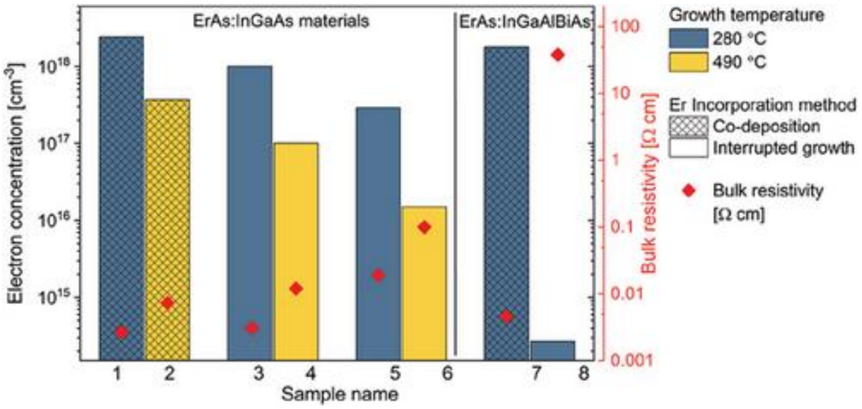

Figure 2: Impact on ErAs:InGa(AlBi)As properties due to growth temperature and ErAs incorporation methods: co-deposition vs. interrupted growth. Altering ErAs growth techniques resulted in a four orders of magnitude reduction in carrier concentration and a similar increase in bulk resistivity [1].

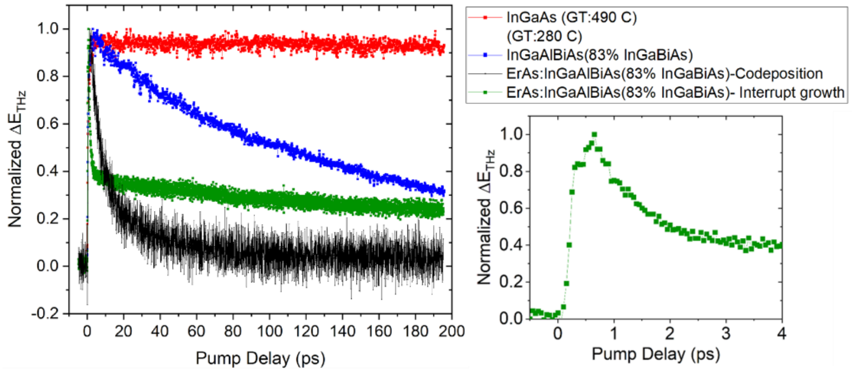

Figure 3: Carrier dynamics measured by Optical Pump (800nm) THz probe spectroscopy demonstrating the fast decay time components in ErAs:InGaAlBiAs materials where sub-picosecond dynamics have been achieved [1]. (GT = Growth Temperature)

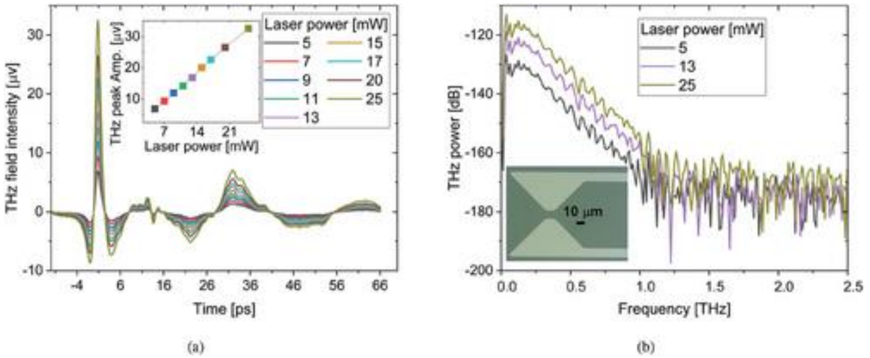

Figure 4: ErAs:InGaAlBiAs detector with fabricated bowtie-shaped photoconductive switch with a 10 µm gap proof of concept results from (a) time domain THz spectroscopy mapping the THz pulse at different laser power levels, and (b) frequency domain, using a fast Fourier-transformed spectrum, showing broadband detection (0.1-1.1 THz) using 1550nm excitation [1].

[1] W. Acuna, et al., Adv. Funct. Mater. 34, 2041853, (2024).