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AlN/GaN/Sapphire heterostructure for high-temperature packageless acoustic wave devices

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Highlights:

- AlN/Sapphire and GaN/Sapphire room-temperature constants sets, which fits our experiments, have been determined.
- An AlN/IDT/GaN/Sapphire three layer structure have been simulated, and a WLAW mode is expected. With 12 μm of AlN, this mode is theoretically confined.
- The three layer device have been successfully made.
- The expected WLAW mode was experimentally measured, and this mode is confined.
- The first-order temperature coefficient of elastic constant and expansion coefficients of AlN/Sapphire bilayer structure have been determined. A partial fit for GaN/Sapphire structure have been obtained.
- The three layer structure was investigated during temperature *in-situ* experiments until 500°C. A TCF of -34.6 ppm/°C have been measured.

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