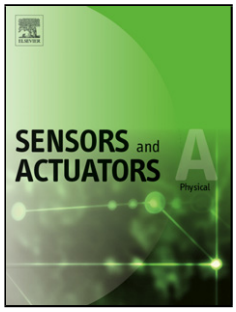


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PII: S0924-4247(18)30597-1
DOI: https://doi.org/10.1016/j.sna.2018.08.011
Reference: SNA 10935

To appear in: *Sensors and Actuators A*

Received date: 9-4-2018
Revised date: 24-7-2018
Accepted date: 9-8-2018

Please cite this article as: Bartoli F, Aubert T, Moutaouekkil M, Streque J, Pigeat P, Zhgoon S, Talbi A, Hage-Ali S, M'Jahed H, Elmazria O, AlN/GaN/Sapphire heterostructure for high-temperature packageless acoustic wave devices, *Sensors and amp; Actuators: A. Physical* (2018), https://doi.org/10.1016/j.sna.2018.08.011

# 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.