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Author:	Thierry Aubert, Universitè de Savoie, France
Title:	**AlN/Sapphire, a promising piezoelectric structure for high temperature SAW applications**
Abstract:	Up to now, the most advanced results regarding high-temperature (500-1000°C) surface acoustic wave (SAW) applications have been obtained using langasite (LGS) as piezoelectric substrate. However, this material is inappropriate for applications in low oxygen environments because of strong oxygen and gallium losses. Moreover, it does not allow wireless interrogation in ISM GHz-bands because of rapidly increasing propagation losses with frequency and temperature. Thus, it would be relevant to look for alternative piezoelectric materials to replace LGS for some specific purposes. Aluminium nitride (AlN) thin films have been theoretically identified as such many years ago. The preliminary step of our study consisted in the optimization of the deposition process of hetero-epitaxied AlN thin films on sapphire substrate by sputtering method. Sapphire was chosen as substrate because it can withstand temperatures higher than 1000°C and is characterized by high acoustic velocities, very close to those of AlN. Thus AlN/Sapphire bilayer structure shows not much dispersion and enables the making of high-frequency SAW devices. Annealings in air atmosphere showed that AlN is stable regarding oxidation up to 700°C, whereas recent experiments revealed that LGS can withstand 1000°C for weeks in air atmosphere, without any surface degradation. Therefore, the behavior of LGS- and AlN/Sapphire-based SAW devices was thoroughly studied in vacuum conditions where hierarchy can be inverted. To circumvent the limitations of platinum, iridium was chosen to make interdigital transducers (IDTs).

	The temperature was increased from the ambient to 1050°C during the first 20 hours and then maintained to this extreme value for 60 hours. S_{21} of both kinds of devices was measured regularly. During this experiment, AlN fully confirmed its potential regarding high-temperature SAW applications, showing far better stability than LGS. Ongoing experiments should clarify how optimize the use of AlN for the aimed applications.