ACOUSTICS2008/1198
Temperature Dependence of Elastic Constant Measurements on Thin Films by Picosecond Ultrasonics

Patrick Emery and Arnaud Devos
IEMN-CNRS, Cité Scientifique - Avenue Poincaré, BP 60069, 59652 Villeneuve d'Ascq Cedex, France

The temperature dependence of mechanical parameters is well-known for bulk materials. New methods have to be developed to access such characteristics on thin films. These measurements are needed for understanding the temperature behavior of acoustic components in microelectronics, as for Bulk Acoustic Wave (BAW) resonators used in wireless communication. A BAW resonator uses the thickness mode resonance of a piezoelectric layer (Aluminium Nitride). In the radio-frequency range, a BAW resonator is a complex stack of various materials in thin film. The temperature dependences measurements offer a way to regulate the performances' drift induced by the warming of the device and to design temperature-independent components. Here, we present a method based on a variable temperature picosecond ultrasonics setup. The procedure is first validated on silica, then applied on various BAW technology materials (AlN, Mo, SiN, W).