ION BEAM ETCHNIG OF PZT THIN FILMS : INFLUENCE OF GRAIN SIZE ON DAMAGES INDUCED

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Lead titano-zirconate ferroelectric thin films have developed a great interest for their applications in memory devices, and more recently in microelectromechanical systems because of their interesting piezoelectric properties. The patterning has become an essential element for PZT integration in devices.
We have chosen a dry etching technique to perform the PZT patterning. The ion beam etching allows to reach a high degree of anisotropy and also to etch materials for which the etch products have a relatively poor volatility. However, the ion bombardment can be a very damaging process for material properties. If the PZT surface is protected by a mask during etching, the lateral sides are particularly exposed to ion bombardment. So it is crucial to understand the mechanism of degradation.
We have studied the influence of etching parameters such as current density and acceleration voltage on damages induced. We have observed a large increase of roughness and a degradation of the electrical properties (dielectric, ferroelectric and piezoelectric). It seems that a high acceleration voltage and a low current density are able to minimize the alteration noted.
We have also observed that the grain size of PZT thin films is a determining parameter. The PZT films, grown by rf magnetron sputtering on $Si/SiO_2/Ti/Pt$ substrates, present grain size ranging from 0,5 µm to 5 µm. It appears that the damage are larger when the grain size increases.
All these results will be presented at the conference.