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Optimizing Pt/TiO_2 templates for textured PZT growth and MEMS devices DANIEL POTREPKA, U.S. Army Research Laboratory, Adelplhi, MD 20783, USA, GLENN FOX, Fox Materials Consulting LLC, Colorado Springs, CO 80908, USA, LUZ SANCHEZ[1], Department of Materials Science & Engineering, University of Maryland, College Park, MD 20742, USA, RONALD POLCAWICH, U.S. Army Research Laboratory, Adelplhi, MD 20783, USA — Crystallographic texture of lead zirconate titanate (PZT) thin films strongly influences piezoelectric properties used in MEMS applications. Textured growth can be achieved by relying on crystal growth habit and can also be initiated by the use of a seed-layer heteroepitaxial template. Template choice and the process used to form it determine structural quality, ultimately influencing performance and reliability of MEMS PZT devices such as switches, filters, and actuators. This study focuses on how 111-textured PZT is generated by a combination of crystal habit and templating mechanisms that occur in the PZT/bottom-electrode stack. The sequence begins with 0001-textured Ti deposited on thermally grown SiO_2 on a Si wafer. The Ti is converted to 100-textured TiO_2 (rutile) through thermal oxidation. Then 111-textured Pt can be grown to act as a template for 111-textured PZT. Ti and Pt are deposited by DC magnetron sputtering. TiO_2 and Pt film textures and structure were optimized by variation of sputtering deposition times, temperatures and power levels, and post-deposition anneal conditions. The relationship between Ti, TiO_2, and Pt texture and their impact on PZT growth will be presented.

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