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Room Temperature Ferroelectricity and Photovoltaic Effect in Atomic Layer Deposited SnTiOX Thin Films R. AGARWAL, Y. SHARMA, Univ. of Puerto Rico, S. CHANG, Univ. of Illinois at Chicago, S. NAKHMANSON, Univ. of Connecticut, C. TAKOUDIS, Univ. of Illinois at Chicago, R. KATIYAR, Univ. of Puerto Rico, S. HONG, 1) Argonne National Laboratory, 2) KAIST — We have studied ferroelectricity and photovoltaic effects in atomic layer deposited 40 nm thick SnTiOX films. These films showed well-defined and repeatable polarization hysteresis loops at room temperature, as detected by polarization versus electric field (P-E) and field cycling measurements. A photo-induced enhancement in ferroelectricity was also observed as the spontaneous polarization increased under white-light illumination, indicating photoferroelectric nature of SnTiOX films. Interestingly, we observed ferroelectric photovoltaic behavior in these films under the illumination of wide spectrum of light, from visible to ultraviolet regions. A short circuit current of 3 micro Amp. and open circuit voltage of 0.12 V were observed under visible light, while these values were found to be slightly lower in ultraviolet illumination. Though, the origin of ferroelectricity is not very clear yet, but we believe that either the formation of non-centrosymmetric crystalline phases in the film matrix during the growth or presence of charged defects in non-stoichiometric SnTiOX could be the possible reasons. Our study provides a way to develop green ferroelectric SnTiOx thin films, which are compatible to semiconducting processes, and can be used for various ferroelectric applications.

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