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Inducing phase transitions of T-like $BiFeO_3$ films by low-energy He implantation ANDREAS HERKLOTZ, Oak Ridge National Lab, CHRISTIANNE BEEKMAN, Florida State University, STEFANIA FLORINA RUS, National Institute for Research and Development in Electrochemistry and Condensed Matter Romania, ILIA IVANOV, NINA BALKE, THOMAS ZAC WARD, Oak Ridge National Lab — Ferroelectric phase transitions of $BiFeO_3$ are found to be controllable through the application of single axis, out-of-plane strain. Low-energy He implantation has been deployed to induce out-of-plane strain in T-like BFO films, while the compressive in-plane strain due to the coherent growth on $LaAlO_3$ substrates remains fixed. Our data shows that He implantation triggers a $M_C - M_A - T$ phase sequence of the T polymorph that is identical to structural changes that are induced with increasing temperature. Mixed phases nanodomains phases are gradually suppressed and disappear above a certain He doping level. Our data shows that the ferroelectric and optical properties of BiFeO3 films critically depend on the He doping level. Thus, the results demonstrates that He implantation can be used as an intriguing approach to study lines in the rich phase space of BFO films that cant be accessed by simple heteroepitaxy. This effort was wholly supported by the US Department of Energy (DOE), Office of Basic Energy Sciences (BES), Materials Sciences and Engineering Division, with user projects supported at ORNLs Center for Nanophase Materials Research (CNMS) which is also sponsored by DOE-BES.

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