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Strained $BiFeO_3$ films: rhombohedral-orthorhombic and rhombohedral-tetragonal phase transitions. Part IV: ultraviolet Raman spectroscopy study[1] DMITRI A. TENNE, A.K. FARRAR, G. MOLINO, Physics Dept., Boise State University, Boise, ID, C. HEIKES, C. ADAMO, J.H. LEE, A. MELVILLE, D.G. SCHLOM, Cornell University, Ithaca, NY, G. SHENG, L.Q. CHEN, Pennsylvania State University, University Park, PA, Y.-H. CHU, National Chiao Tung University, Hsinchu, Taiwan, Q. HE, R. RAMESH, University of California, Berkeley, CA — Epitaxial $BiFeO_3$ films grown by molecular-beam epitaxy on substrates inducing different lattice-mismatch strain ($YAlO_3$, $SrLaAlO_4$, $PrScO_3$) have been studied by variable- temperature ultraviolet Raman spectroscopy. Temperature evolution of Raman spectra from $BiFeO_3$ films indicates the phase transitions from rhombohedral to tetragonal phase in compressively strained films on $YAlO_3$ and $SrLaAlO_4$ substrates. The films grown on PrScO3 substrates are subject to $\sim$1.3% tensile strain, and undergo the transition from rhombohedral to orthorhombic phase at about 550-600 K. The temperature dependence of Raman intensities of certain characteristic peaks indicates the possibility of coexisting rhombohedral and orthorhombic phases in the temperature range 400-550 K. Raman results are consistent with the phase diagram calculated using the phase field model.

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Dmitri A. Tenne
Physics Dept., Boise State University, Boise, ID

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