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Experiment and Calculations on the Defect-Induced Broadening in One-Dimensional Photonic Bandgaps Y.H. LU, M.D. HUANG, S.Y. PARK, P.J. KIM, Y.P. LEE, Quantum Photonic Science Research Center and BK21 Program Division of Advanced Research and Education in Physics, Hanyang University, J.Y. RHEE, BK21 Physics Research Division and Institute of Basic Science, Sungkyunkwan University, C.K. HWANGBO, Department of Physics, Inha University — Impurity bands are generated by the coupling of defect modes in one-dimensional photonic crystals, which move the bandgap edges towards the shorter and the longer wavelengths. Combining one structure with impurity band and another without it, a greatly broadened photonic bandgap is created when the two structures are well designed. The samples are fabricated by the electron-beam evaporation, which are composed of SiO_2 and TiO_2. A good agreement between the experimental and the theoretical results is obtained. The further calculations, based on the 4×4 transfer-matrix method, strongly reveal the validity of this approach, so-called the defect-induced broadening. More importantly, the widened omni-directional photonic bandgaps are also realized by this means.

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