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Fabrication of Highly Reflecting Si/SiO_2 Bragg Mirrors Using Transferred Nanomembranes[1] WEINA PENG, FRANK S. FLACK, MICHELLE M. ROBERTS, PAULA E. COLAVITA, DONALD E. SAVAGE, ROBERT J. HAMERS, MAX G. LAGALLY, MARK A. ERIKSSON, University of Wisconsin Madison — A long term goal of electronics and photonics is the integration of both on the same materials platform and substrate. Silicon and silicon-dioxide are an excellent photonic materials pair, due to the superior properties of the oxide-silicon interface, and due to the large index-of- refraction contrast in this materials pair. We present a novel method to fabricate Si/SiO_2 mirrors based on transfer of freely released silicon nanomembranes and subsequent thermal oxidation. The surface roughness of the transferred membranes is examined using atomic force microscopy. RMS roughnesses as small as 0.25nm are achieved. The reflectivity is also measured for our transferred membranes, and an increase in reflection is easily observed as the number of stacked membranes is increased. The experimental reflectivity data match theoretical calculations within 10%. We discuss the possibility of aligning many membranes to make complicated photonic structures.

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