Comparative *In-situ* Study of the Initial Growth Trends of Atomic Layer Deposited Al_2O_3 Films

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Porous Silicon Characterization

A Micrometrics 3Flex Physisorption system was used to calculate nitrogen isotherm, BET surface area, and pore size distribution on freshly etched porous silicon wafers. To perform the measurement, a silicon wafer piece with thickness of 0.07 cm was etched to create pores on one side, then the sample was cut into three pieces, each approximately 0.5 x 0.8 cm^2, and all three pieces, with total weight of ~0.18 g, were placed simultaneously into the BET measurement tube. Prior to sorption measurements, samples were degassed overnight at a temperature of 100°C using a Micrometrics Smart VacPrep Gas Adsorption Sample Preparation Device. Nitrogen was used as an absorbent at 77.3 K. Using Micrometrics 3Flex software BET surface area and average pore diameter were found to be 1.8 m^2/g and 64 Å, respectively. (Figure S1) Since the etched sample has surface area of 1.8 m^2/g, using a silicon density of 2.33 g/cm^3, we expect that for an etched wafer piece 1 cm x 1 cm in size and 0.07 cm thick, the total surface area of the etched region would be ~ 2900 cm^2, so that the total surface area enhancement factor is ~ 2900 cm^2/cm^2 = 2900. We note that the pores did not extend all the way through the thickness of the wafer, so the mass used to estimate surface area is substantially larger than the mass of the porous region. We repeated the experiment on porous silicon wafers that had been stored in laboratory air for three months and found that the BET surface area and pore size diameter were 2.1 m^2/g and 69 Å, respectively.

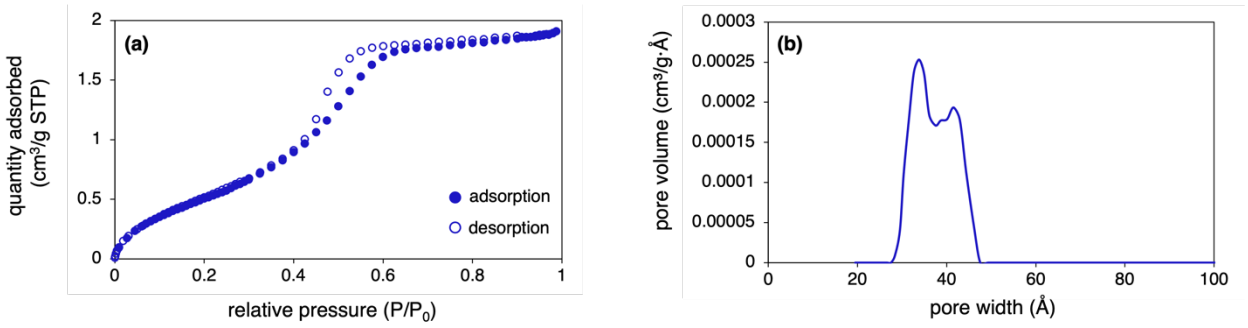

Figure S1. a) N_2 isotherm and b) pore size distribution of starting porous silicon samples.