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UV Polarizer Fabricated by Diblock Copolymer Lithography
KOJI ASAKAWA, VINCENT PELLETIER, MINGSHAW WU, DOUGLAS H. ADAMSON, RICHARD A. REGISTER, PAUL M. CHAIKIN, Princeton University — Transmission UV polarizers are desired for next-generation semiconductor device fabrication using ArF or F_2 excimer laser lithography. Controlling polarization is essential especially for high numerical aperture (NA) immersion lithography processes. The polarizer requirements are thickness less than 1 mm and low absorption of the light used for the exposure. A wire grid polarizer is ideal for this purpose but it requires wires with a pitch less than quarter of wavelength of the light. A cylinder-forming polystyrene-polyhexylmethacrylate diblock copolymer (PS-PHMA, 21-64 kg/mol) was used as a mask for fabrication because its cylinders macroscopically align by simple application of shear stress, and the PHMA domains etch faster than PS by reactive-ion etching (RIE), providing sufficient contrast for pattern transfer. The diblock was spin-coated on a UV transparent fused silica substrate and shear-aligned. The stripe pattern was transferred by RIE onto the substrate by a multilayer technique to enhance the pattern height, then a metal was deposited by evaporation. Finally, the remaining polymer was lifted off to complete the wire grid, having a 33nm pitch (16.5nm line and space). The UV light polarization characteristics of these grids will be presented.

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