

Abstract Submitted
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Selective epitaxy of III-V semiconductor on Si substrates patterned by diblock copolymer¹ ZUOMING ZHAO, Dept. of Electrical Engr., UCLA, TEA-SIK YOON, YA-HONG XIE, Dept. of Materials Science and Engineering, UCLA, KANG L. WANG, Dept. of Electrical Engr., UCLA, DUYEOL RYU, THOMAS P. RUSSELL, Polymer Science and Engr. Dept., Univ. of Massachusetts, Amherst, MA, 01003 — III-V semiconductors, GaAs and InAs, were grown on Si substrates using molecular beam epitaxy. Si substrates were patterned with SiO₂ using thin films of diblock copolymer, PS-*b*-PMMA. Using a thin film of a random P(S-*r*-MMA) copolymer to balance interfacial interactions, spin coated film of PS-*b*-PMMA, having cylindrical microdomains, were annealed 170°C to orient the microdomains normal to the surface.[P. Mansky et al, Science, 275, 1997 (1458)] After removal of the PMMA cylinders, RIE was used to transfer the copolymer template to the substrate yielding a hexagonal array of ~20 nm pores in the substrate. GaAs and InAs were selectively filled in pores. Images from scanning electron microscopy show that GaAs and InAs quantum dots with density of $8 \times 10^{10} \text{ cm}^{-2}$ and diameter of 30nm were achieved by selective epitaxy. This provides the possibility of patterning of nanostructures for integration of III-V materials on Si and offers new potentials for electronic and optoelectronic applications based on regular or homogeneous structures.

¹Marco Focus Center on Functional Engineered Nano Architectonics

Zuoming Zhao
UCLA

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