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Pyramidal Magneto-Optical Atom Traps on a Chip SAMUEL POLLOCK, JOSEPH COTTER, ATHANASIOS LALIOTIS, FERNANDO RAMIREZ-MARTINEZ, MICHAEL TRUPKE, ED HINDS, CENTRE FOR COLD MATTER, IMPERIAL COLLEGE LONDON TEAM — We demonstrate the fabrication and development of scalable arrays of pyramidal magneto-optical micro-traps in silicon as an elegant and simple way of capturing atoms from a thermal vapour directly on the surface of atom chips. The integration of these devices offers good prospects for reducing the cost and complexity of atom-chip experiments. Potential applications range from using an array of small cold atom clouds to map local magnetic field variations or sensing inertial forces. The micropyramids could also serve as single-atom sources for loading integrated optical cavities, allowing for production of single photons on demand for applications in QIP. We form the pyramids using an anisotropic etching process, preferentially etching the 100 plane to produce hollow pyramids in the surface of the wafer. Further processes have been developed to effectively smooth the rough mirror surfaces resulting from the anisotropic etch whilst maintaining the planar structure. We have recently demonstrated that these microfabricated pyramids can trap atoms from a thermal vapour. We present experimental data and associated theoretical models to describe the capture and loss processes of the MOT, as well as the properties of the cold atomic sample in the sub-mm^3 trapping region of the micropyramids.

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