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Growth of carbon nanofibers on tipless cantilevers: process development and applications in scanning probe microscopy HONGTAO CUI, Condensed Matter Sciences Division, Oak Ridge National Laboratory, SERGEI KALININ, Condensed Matter Sciences Division, Oak Ridge National Laboratory, XIAOJING YANG, Department of Materials Science and Engineering, University of Tennessee at Knoxville, DOUGLAS LOWNDES, Condensed Matter Sciences Division, Oak Ridge National Laboratory — Carbon nanofibers (CNFs) are grown on tipless cantilevers as probe tips for scanning probe microscopy. A catalyst dot pattern is formed on the surface of the tipless cantilever using electron beam lithography and CNF growth is performed in a direct-current plasma enhanced chemical vapor deposition reactor. Because the CNF is aligned with the electric field near the edge of the cantilever during growth, it is tilted with respect to the cantilever surface, which compensates partially for the probe tilt introduced when used in scanning probe microscopy. CNFs with different shapes and tip radii can be produced by variation of experimental conditions. The tip geometries of the CNF probes are defined by their catalyst particles, whose magnetic nature also imparts a capability for imaging magnetic samples. We have demonstrated their use in both atomic force and magnetic force surface imaging. These probe tips may provide information on magnetic phenomena at the nanometer scale in connection with the drive for ever-increasing storage density of magnetic hard disks.

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