3D Nanostructures fabricated by ion beam technology

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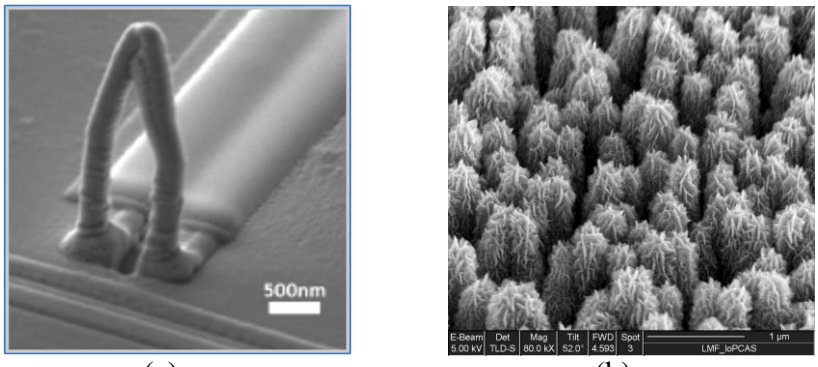
Three-dimensional (3D) nanostructures and nanodevices such as optoelectronic devices, nanosensors, biological information detectors, plasmonics and quantum devices, have attracted tremendous interest in the past few years due to their unique properties, which generally present excellent functional properties than those of planar nanodevices.

In this work, we developed a technique for the geometrical manipulation of freestanding nanowires using ion beam irradiation with nanometer-scale resolution to fabricate 3D nanostructures (Fig.1a). Such structures could integrate with conventional superconducting quantum interference devices to detect magnetic fields both parallel and normal to the substrate. Property characterizations suggest that our manipulating technique allows tailoring of freestanding superconducting loops for size and geometry.

We also designed and fabricated a 3D hierarchical structure of flower-like few-layer graphene nanosheets (GNSs) grown on diamond nanocone arrays (DNAs) (Fig.1b). The flower-like GNSs is synthesized by hot filament chemical vapor deposition, and DNAs are fabricated by maskless ion bean etching. The results indicated that the 3D hierarchical structure enhanced obviously the surface's wettability into a large contact angle state with ultrahigh adhesion, which provide a strategy to understand the ultra-adhesive mechanism of the "rose effect" and enhance the wettability of graphene for many practical applications.



(a) (b)

Figure 1: (a) The superconducting quantum interference device; (2) 3D hierarchical structure of flower-like few-layer graphene nanosheets grown on diamond nanocone arrays.