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Electron emission from graphene nanosheets on Si nanocone arrays

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Graphene is a 2-D planar graphitic nanostructure, and its open surface and sharp edge producing a large aspect ratio make it attractive for field electron emission applications, because the work function at the edges was reduced as compared to the graphene sheet body. Therefore, the growth and alignment of graphene sheets in one particular direction has become a breakthrough much sought after in the development of graphene as a field emitter. Here, we report a newly designed graphene emitter—a petaloid graphene nanosheet of few layers, grown on a silicon nanocone array by hot-filament chemical vapor deposition method, in which the nanocone structure functionalizes the graphene nanosheet and serves as a template causing the sharp edges of graphene nanosheets to form a floralform tip on each cone, yielding a strong tip effect for field emission applications. These results demonstrate that the as-designed floral-clustered graphene nanosheet emitter is an excellent cold electron emission source.

Keywords: graphene, nanosheet, Si nanocone, electron emission