Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Supporting Information

Direct Imaging of Single Ni Atom Cutting Graphene to Form Graphene Nanomesh

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Supplementary Results

Fig. S1 shows STEM image of the product prepared by arc-dicharge in water without Ni. We can find that graphene sheet without obvious nanopores are obtained, which indirectly proves the cutting actions of Ni atom or particles to graphene to form GNM during the arc-discharge of Ni-containing solution.

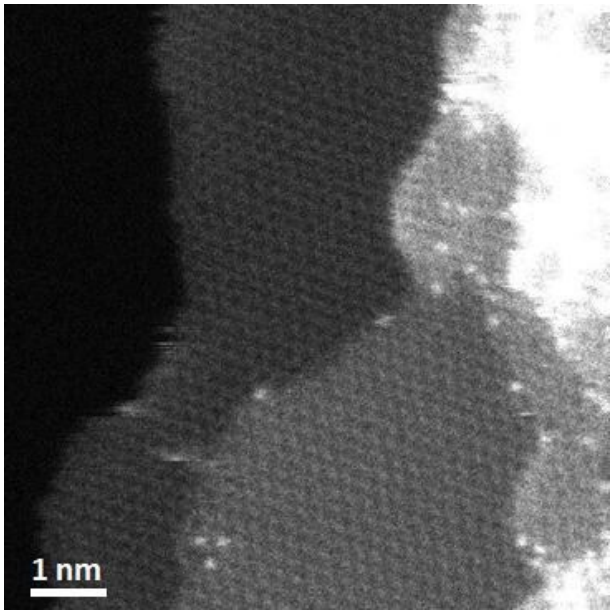

Fig. SI Graphene sheet without nanopores prepared by arc-discharge in water.

Fig. S2 shows ADF-STEM image and EELS analysis of GNM. From the previous paper published in Nature (Nature 464, 571 (2010).), we know that ADF image can resolve and identify the chemical type of every atom in monolayer 2D materials. In the “Z contrast” image of monolayer graphene, the image intensities of atoms are proportional to their atom numbers. The brighter dot means a heavier atom. We compare the intensities of the dopants in graphene as shown in Fig. S2 and find there is only one Ni atom in the bottom right portion of image (brightest atom). Other atoms with middle intensity are Si atoms, which cannot be avoided in the synthesis process of graphene. These Si atoms are relative stable in microscope. This further proves the cutting action of Ni atoms or particles to graphene.

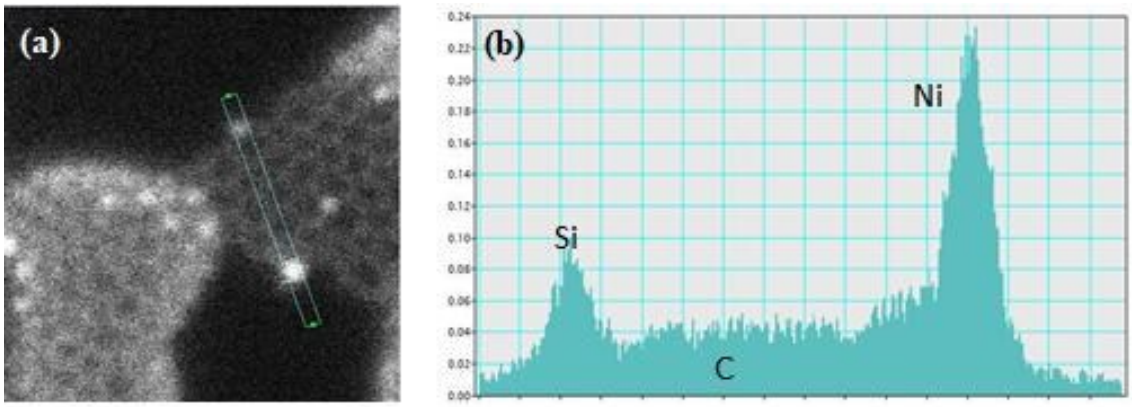

Fig. S2 Identification of atom species by the intensities of each atom.

Fig. S3 shows TEM image of GNM prepared by liquid arc discharge in aqueous solution of $NiSO_4$, indicating that GNM is in the scale of several microns.

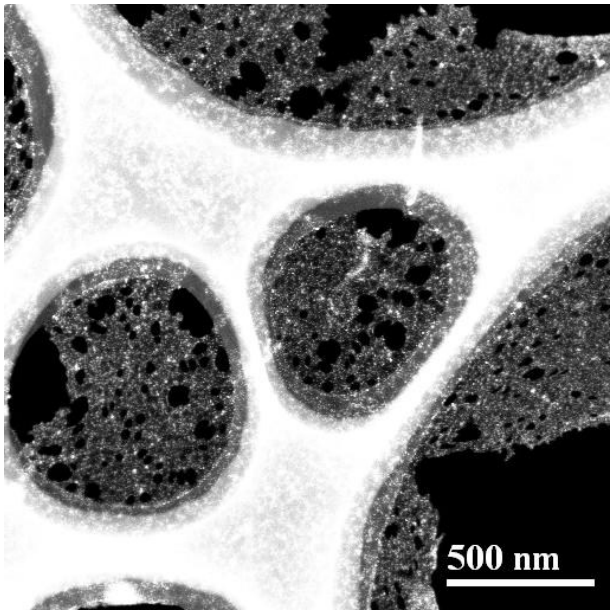

Fig. S3 Large area GNM supported on the carbon grid.