Supporting Information for

The growth behavior of graphene on iron-trichloride-solution-soaked copper substrates in a low pressure chemical vapor deposition

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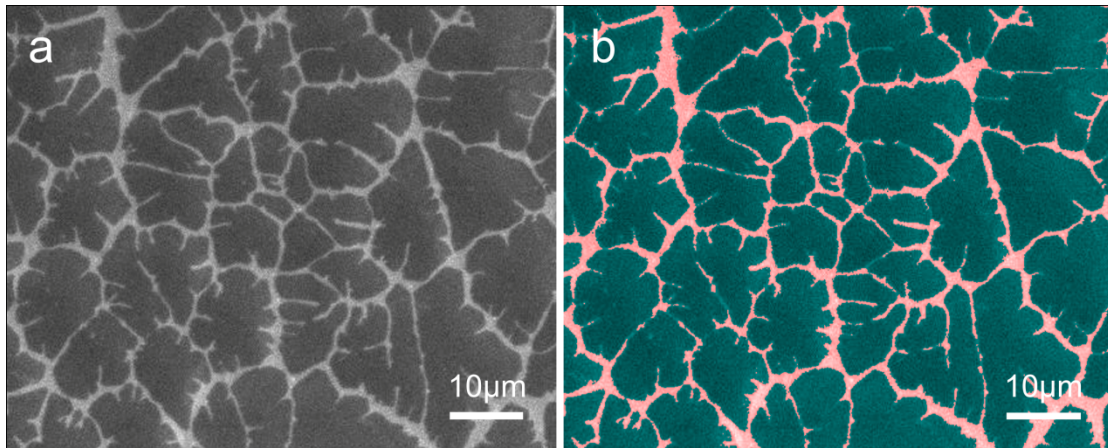
Fig. S1 SEM images of graphene domains. (a) An original SEM image of graphene on Cu substrate. (b) The artificial image for the coverage statistics after a gray level calibration. The coverage is calculated by counting the number of Black pixels and red pixels, which represents the graphene covered area and not covered area, respectively.
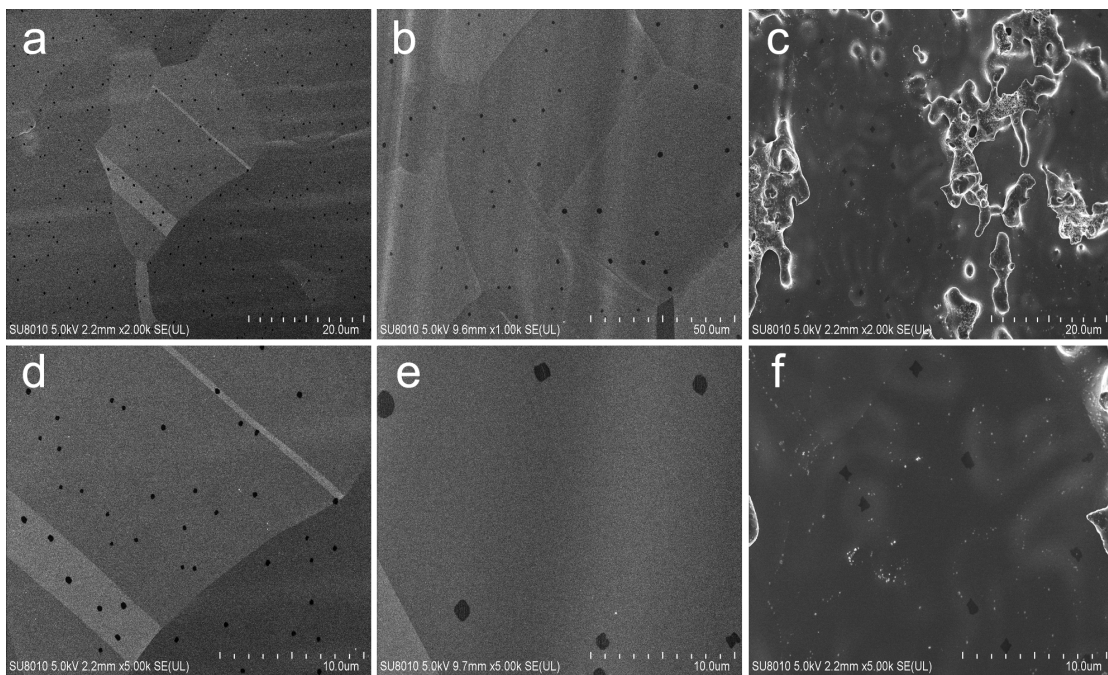
Fig. S2 SEM images of graphene domains. (a), (d)   Graphene domains on the Cu substrate as received. (b), (e) Graphene domains on the Cu substrate preoxidized by oxygen for 10 seconds at 180 centigrade. (c), (f) Graphene domains on the Cu substrate soaked by high concentration (>0.5M) $FeCl_3$ solution. The growth time for all samples is 15 seconds.
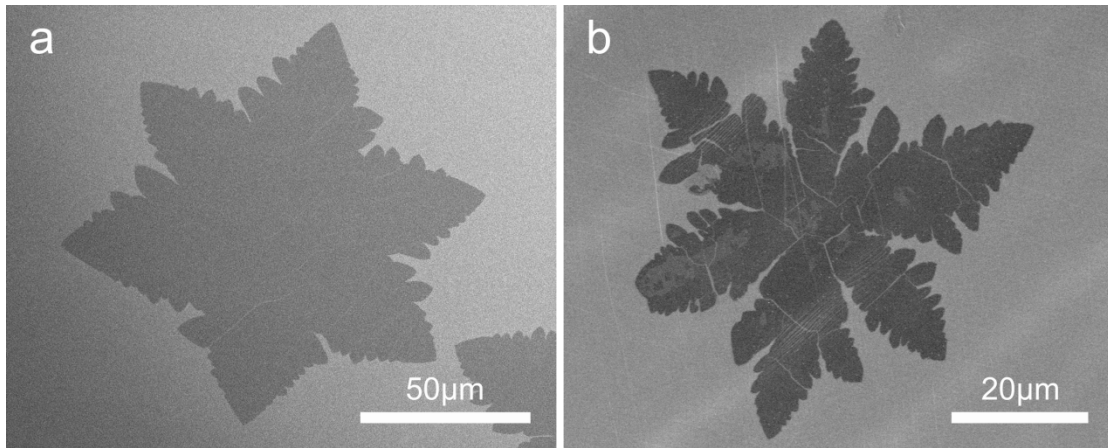
Fig. S3 SEM images of graphene domains. (a) A six-branched graphene domain on the inside surface of Cu envelop not soaked by FeCl₃ solution. (b) A six-branched graphene domain on the inside surface of Cu envelop soaked by FeCl₃ solution.
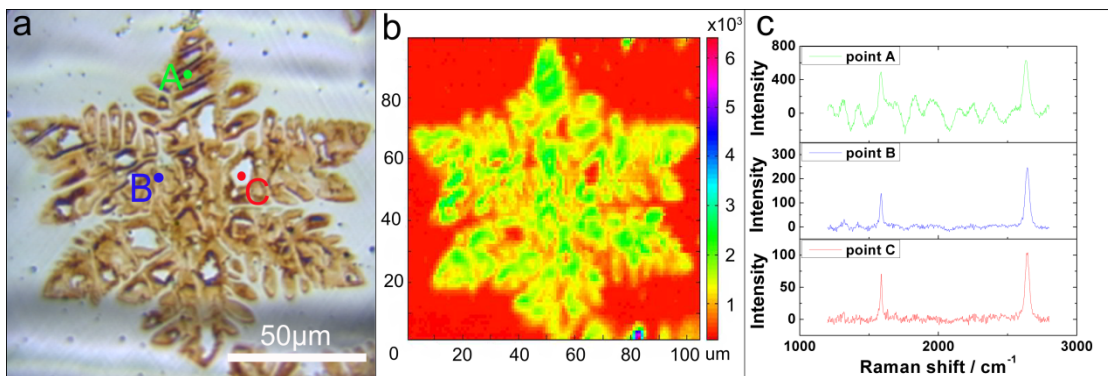
Fig. S4 Raman spectrum and Raman mapping of a dendritic graphene domain (a) The optical microscopy image of a snow-flower shape graphene domain on Cu substrate. A, B and C points denote the Raman spectra sampling spots. (b) A Raman map of I_G for the graphene domain as showed in (a). (c) The Raman spectra (not filtered) taken from the spots A, B and C. The shape and size of G and 2D peaks show that the graphene domain is predominantly single layer.

Domain growth rate calculation method:

For simplicity without losing the truth, we dropped the anisotropy of individual growth rate and assumed a circle shaped graphene domain. In this case, the coverage growth rate in measure of area per unit time can be related to the individual domain growth rate as following equation:

$$\frac{dA}{dt} = D \cdot 2\pi\bar{r} \cdot \bar{v} = D \cdot 2\pi\bar{v}^2 t \qquad \text{(S1)}$$

$$\bar{v} = \frac{d\bar{r}}{dt} \qquad \text{(S2)}$$

Where D is the density of graphene domains, v is the radial growth rate.