Synthesis of BCN layers and anisotropic etching for nanoribbon fabrication

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Developing heterostructures with controlled shape, size and edges can introduce unexpected electronic and magnetic properties. Furthermore it has been predicted that atomically thin h-BN nanoribbons (NRs) can exhibit narrow band gap with improved conductivity owing to transverse electric field or edge structures. Similarly, half-metallicity in h-BCNNRs has been expected by theoretical analysis [1].

The anisotropic etching of hexagonal boron-carbon-nitrogen (h-BCN) was achieved by atmospheric pressure chemical vapor deposition (APCVD) technique using H_2 (2.5 sccm) and Ar (85 sccm) gas mixture at 1020^0C annealing temperature. We synthesized h-BCN layers by mixing camphor and borazine solid precursors as C, N and B source. XPS and Raman analysis were carried out to confirm presence B and N along with C atoms and formation of h-BCN like structure. Figure 1 shows field emission scanning electron microscope (FESEM) images confirming anisotropic etching of h-BCN film with etched hole, NRs and other particular structures similar to that of graphene [2] and h-BN films [3]. The anisotropic etching process of h-BCN basal plane and thereby fabricating NRs and other structures can open up new possibilities in 2D hybrid materials fabrication [4].

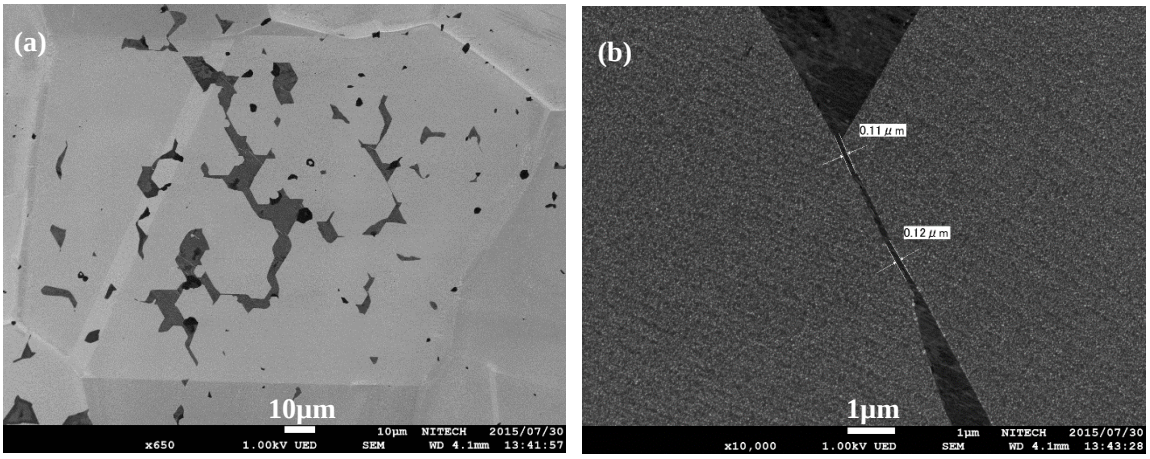

Fig 1 (a) FESEM image of h-BCN film with etched hole, NRs and other particular structures (b) FESEM image of BCN nanoribbon.

References

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