NEW SYNTHESES OF GRAPHENE AND DIAMOND

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We discovered (using a home-built system) a new way to synthesize single crystal, fold- and wrinkle-free, and extremely flat, monolayer graphene ('SCG') films that are epitaxial to Ni(111) foil (both sides of the foil). We generate our Ni(111) foils by a high temperature anneal in argon and hydrogen gas mixture from as-received polycrystalline Ni foils.[1] Synthesis is 'very fast' and the Ni(111) foil yields high quality SCG on both sides within a few minutes—and 'over and over'. I'll explain about our method and some implications of growing such high quality SCG, and rapidly, at least from our perspective.

Diamond & graphite are essentially isoenergetic at STP (298K, 1 atm) as is true at higher temperatures (the same for hBN and cBN). *If at chemical equilibrium* there would be ~50 wt% diamond and ~50 wt% graphite for a carbon sample containing only graphite and diamond. And yet there seems to be a widely held perception that it 'must be' more difficult to form diamond (or cubic boron nitride) than graphite (or hBN).

Well, to date, this has been true! Also (on Earth) there seems to be much more natural graphite than natural diamond, and there is (now) much more synthetic graphite annually produced than synthetic diamond. But must this always be so, going forward? I will describe how one might synthesize diamond and cBN in new ways; and see [2]. *Supported by the Institute for Basic Science (IBS-R019D1).*

References

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