CLAIMS

1. A chemical vapor deposition process comprising:

    heating a porous metal template at a temperature range of 500 to 2000 ºC; and

    passing a gas mixture comprising a carrier gas carrying along a vapor of an organometallic compound and at least one of a carbon precursor gas and a boron nitride precursor gas through the heated metal template,

    wherein the heating temperature causes the decomposition of the organometallic compound vapor into metal particles, the carbon precursor gas into graphene domains, and/or the boron nitride precursor gas into hexagonal-boron nitride domains,

    wherein the metal particles are deposited on the surface and within the pores of the metal template,

    wherein the graphene domains and/or the hexagonal-boron nitride domains nucleate and grow on the metal particles and on and within the metal template to form a three-dimensional interconnected porous network of graphene and/or hexagonal-boron nitride, and

    wherein the three-dimensional interconnected porous network of graphene and/or hexagonal-boron nitride comprises walls having a thickness of around 80 µm to 100 µm.

2. The process of claim 1, wherein the metal template is macroporous.

3. The process of claim 1, wherein the metal template comprises nickel or copper.

4. The process of claim 1, wherein the organometallic compound comprises a metallocene.

5. The process of claim 4, wherein the metallocene is selected from the group consisting of ferrocene, nickelocene, cobaltocene, ruthenocene, chromocene and osmocene.

6. The process of claim 4, wherein the vapor of the metallocene is formed by the sublimation of the metallocene in powder form.

7. The process of claim 4, wherein the vapor of the metallocene is formed by the boiling of the metallocene in solution form.

8. The process of claim 1, wherein the metal particles accelerate the nucleation and growth of the graphene domains and/or the hexagonal-boron nitride domains.

9. The process of claim 1, wherein the carbon precursor gas comprises an alkane, alkene or alcohol, up to a carbon chain of 4 carbon atoms.

10. The process of claim 1, further comprising removing the metal template from the three-dimensional interconnected porous network of graphene and/or hexagonal-boron nitride.

11. The process of claim 10, wherein the metal template is removed by contacting with an acid.

12. The process of claim 1, wherein the carrier gas carries along a vapor of an organometallic compound and at least one of a carbon precursor gas and a boron nitride precursor gas into a chemical vapor deposition chamber prior to passing the gas mixture through the heated metal template.