Claims:

1. A method of depositing Pt containing nanodots on a catalyst carbon support structure, the method comprising the steps of:

a. forming a vapor of $Pt(PF_3)_4$,

b. exposing a surface of the catalyst carbon support structure to the vapor of $Pt(PF_3)_4$,

c. purging the surface of the catalyst carbon support structure with a purge gas to remove the vapor of $Pt(PF_3)_4$,

d. exposing the surface of the catalyst carbon support structure to a second reactant in gaseous form,

e. purging the surface of the catalyst carbon support structure with a purge gas to remove the second reactant,

f. repeating steps a. - e. to form a plurality of the Pt containing nanodots on the catalyst carbon support structure

wherein the temperature of the catalyst carbon support structure during step a. and/or step b. is from 50 degrees C to 300 degrees C, preferably from 100 degrees C to less than 200 degrees C, more preferably 100 degrees C to 175 degrees C or to less than 175 degrees C, such as 100 degrees C or 150 degrees C.

2. The method of claim 1, wherein the second reactant comprises an oxidizing agent selected from the group consisting of H_2O, O_2, O_3, NO_2, oxygen radicals and mixtures thereof; preferably O_2.

3. The method of claim 1, wherein the second reactant comprises a reducing agent selected from the group consisting of H_2, NH_3, SiH_4, Si_2H_6, Si_3H_8, SiH_2Me_2, SiH_2Et_2, $N(SiH_3)_3$, hydrogen radicals, hydrazine, methylhydrazine, amines, NO, N_2O, and mixtures thereof; preferably H_2.

4. The method of any of claims 1 to 3, wherein the largest linear dimension of the nanodots has a range from 0.25 nm to 15 nm and/or a mean of 2nm - 7 nm.

5. The method of any of claims 1 to 4, wherein the repetition of steps a.-e. is from 5 to 40 times.

6. The method of any of claims 1 to 5, wherein the plurality of the Pt containing nanodots are formed by an atomic layer deposition reaction.

7. The method of any of claims 1 to 6, wherein each Pt containing nanodot comprises sufficient Pt so that a) the atomic percentage of Pt for the catalyst carbon support structure with the plurality of the Pt containing nanodots is from 0.5% to 3%, preferably 1% to 2% and/or b) the weight percentage of Pt is from 5% to 50%, preferably 10% to 30%.

8. The method of any of claims 1 to 7, wherein the catalyst carbon support structure contains at least 30% carbon by weight.

9. The method of claim 8 wherein the plurality of Pt nanodots are formed directly on a carbon component of the catalyst carbon support structure.

10. The method of claim 8 or 9, wherein the catalyst carbon support structure :

- is selected from single wall fullerenes, multiwall fullerenes, single wall or multiwall nanotubes and nanohorns, and/or
- has a density of about 0.2g/cm^3 to about 1.9g/cm^3 such as specialty carbons like VULCAN or Imerys' SUPER C65.