Claims

1. Catalytically active material, comprising grains of non-graphitizing carbon with iron nanoparticles dispersed therein,

   wherein

   d_p, the average diameter of iron nanoparticles in the non-graphitizing carbon grains, is in the range of 1 nm to 20 nm,

   D, the average distance between iron nanoparticles in the non-graphitizing carbon grains, is in the range of 2 nm to 150 nm, and

   ω, the combined total mass fraction of metal in the non-graphitizing carbon grains, is in the range of 30 wt% to 70 wt% of the total mass of the non-graphitizing carbon grains,

   wherein d_p and D are measured by TGZ-TEM as described herein,

   and wherein

   d_p, D and ω conform to the following relation:

   $4.5\ d_p / \omega > D \geq 0.25\ d_p / \omega$.

2. Material according to claim 1, wherein the non-graphitizing carbon grains exhibit the following particle size distribution: d10 = 5µm, d50 = 40 µm, d90 = 150 µm.

3. Material according to any one of claims 1 to 2, wherein the total mass fraction of nitrogen in the non-graphitizing carbon grains is less than 1 wt% of the total mass of the non-graphitizing carbon grains.

4. Material according to any one of claims 1 to 3, wherein d_p is in the range of 4 nm to 18 nm.

5. Material according to any one of claims 1 to 4, wherein d_p is in the range of 6 nm to 14 nm.

6. Material according to any one of claims 1 to 5, wherein the material has been doped with dopant metal,

   and wherein the dopant metal is selected from Na (sodium), K (potassium), Ca (calcium), Mg (magnesium) or mixtures thereof,

   and wherein the non-graphitizing carbon grains exhibit a molar ratio RDM = n(iron) : n(dopant metal) in the range of 5 to 1000.

7. Material according to any one of claims 1 to 5, wherein the material has been combined with secondary metal,

   and wherein the secondary metal is selected from group 1 or group 2,

with group 1 defined as: Mo (molybdenum) or W (tungsten) or mixtures thereof, and

with group 2 defined as: Co (cobalt) or Cu (copper) or Mn (manganese) or mixtures thereof,

and wherein the non-graphitizing carbon grains exhibit a molar ratio RSM = n(iron) : n(secondary metal) in the range of 1 to 50.

8. Process for the manufacture of material according to any one of claims 1 to 7, comprising the following steps:

   (a) providing an aqueous solution comprising metal precursor and organic carbon source,

   wherein the metal precursor comprises one or a combination of more than one organic, at least partially water soluble, salts of iron, and

   wherein the organic carbon source is one or a combination of more than one saturated, aliphatic di-, tri-, or polycarboxylic acids,

   (b) spray drying or freeze drying the aqueous solution of metal precursor and organic carbon source and, thus, obtaining intermediate product P,

   (c) thermo-treating intermediate product P at a temperature in the range from 200 °C to 380 °C.

9. Process according to claim 8, wherein the organic carbon source is selected from malonic acid, tartaric acid, citric acid and mixtures thereof.

10. Process according to any one of claims 8 to 9, wherein intermediate product P is thermo-treated at a temperature in the range from 255 °C to 375 °C for 1 to 4 hours.

11. Process according to any one of claims 8 to 10, wherein intermediate product P is thermo-treated at a temperature in the range from 300 °C to 350 °C for 1 to 4 hours.

12. Use of material according to any one of claims 1 to 7 as a catalyst.

13. Use according to claim 12, wherein the catalyst is a catalyst for the hydrogenation of organic compounds and/or the reductive amination of carbonyl compounds.

14. Use according to claim 12, wherein the catalyst is a catalyst for the conversion of carbon monoxide, carbon dioxide or mixtures thereof with hydrogen, to alkenes, alkanes or mixtures thereof.