

CLAIMS

1. A composite obtainable by placing elemental sulphur into the internal pores of a porous graphitic matrix, wherein the internal pores comprise mesopores with an average size of between 2 and 50 nm, and micropores with an average size of below 2 nm, wherein the graphitic matrix before loading with sulphur has a specific surface area comprised between 100 and 500 m²/g, and wherein the graphitic matrix has form of fiber.
2. The composite according to claim 1, wherein the porous graphitic matrix is selected from carbon nanofibers, carbon nanorods, carbon nanowires or carbon nanotubes, and combinations thereof.
3. The composite according to claim 2, wherein the porous graphitic matrix is carbon nanofibers, preferably graphene nanofibers.
4. The composite according to claim 3 wherein the carbon nanofibers have an average diameter comprised between 5 and 200 nm, and a length comprised between 500 nm and 5 μm.
5. The composite according to anyone of claims 1 to 4, wherein the pore volume of the porous graphitic matrix before loading with sulphur is comprised between 0,2 and 1,0 cm³/g, preferably between 0.3 and 0.8 cm³/g, more preferably between 0.3 and 0.5 cm³/g.
6. The composite according to claim 5, wherein the pore volume of the micropores of the porous graphitic matrix before loading with sulphur is comprised between 5 and 10 % v/v of the total pore volume of the graphitic matrix.
7. The composite according to anyone of claims 1 to 6, wherein the specific surface area of the porous graphitic matrix before loading with sulphur is comprised between 200-400 m²/g, preferably between 250-350 m²/g.
8. The composite according to anyone of claims 1 to 7, wherein the specific surface area of the composite loaded with elemental sulphur is comprised between 0.1 and 10 m²/g, preferably between 0.5 and 2 m²/g.

9. The composite according to anyone of claims 1 to 8, wherein the pore volume of the composite loaded with elemental sulphur is comprised between 0.0001 and 0.01 cm³/g.
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10. A composite paste comprising the composite according to anyone of claims 1 to 9, a conductive additive, and a binder, preferably comprising from 70% to 90% w/w of the composite, from 5% to 15% w/w of the conductive additive, and from 5% to 15% w/w of the binder.
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11. An electrode comprising the composite according to anyone of claims 1-9 and a metallic support, wherein the metallic support is preferably selected from the group consisting of metal films, metal foils, metal nets and expanded metal grids, or combinations thereof.
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12. A battery comprising a cathode comprising the composite according to anyone of claims 1 to 9, and an anode comprising lithium or a lithium-containing material.
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13. A process to prepare the composite according to anyone of claims 1 to 9, comprising the step of placing sulphur into the internal pores of a fibrous porous graphitic matrix comprising mesopores with an average size of between 2 and 50 nm, and micropores with an average size of below 2 nm, and having a specific surface area comprised between 100 and 500 m²/g.
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14. A process according to claim 13, comprising the following steps:
- a) preparing a solution of elemental sulfur in a solvent, preferably carbon disulfide,
 - b) adding the graphitic porous matrix to the solution obtained from step a) to obtain a mixture, and
 - 30 c) stirring the mixture obtained in step b) and evaporating the solvent to precipitate sulfur into the pores of the graphitic porous matrix.
15. Process according to claim 13, comprising the following steps:
- a) preparing an aqueous solution of a chemical precursor of sulphur,

- b) preparing an aqueous dispersion of the graphitic porous matrix, and
- c) mixing the aqueous solution from step a) and the aqueous dispersion from step b), in the presence of an acid, to precipitate sulfur into the pores of the graphitic porous matrix.

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16. Process according to claim 13, comprising the step of mixing solid elemental sulphur particles and the graphitic porous matrix by ball milling.

10 17. Process according to anyone of claims 13-16, wherein the graphitic porous matrix is carbon nanofiber, preferably graphene nanofiber.

18. Use of the composite according to anyone of claims 1 to 9 as an electrode for batteries, preferably an electrode for lithium batteries or lithium-ion batteries.