CLAIMS

1. A composite material comprising:

a first shielding layer;

a metal containing layer over the first shielding layer;

a second shielding layer over said metal containing layer and opposite the first shielding layer; and

one or more structural layers over the second shielding layer and opposite of said metal containing layer, each structural layer comprising multifunctional composite materials, wherein the one or more structural layers comprise at least one atomic oxygen resistance layer over a micrometeoroid layer, the micrometeoroid layer being disposed on the second shielding layer opposite said metal containing layer;

wherein the first shielding layer and the second shielding layer each and/or in combination with other layers of the composite material provide the composite material with radiation shielding characteristics.

2. The composite material of claim 1, wherein the multifunctional composite materials comprise oxidation-resistant material, heating resistant material, and polymer-based material.

3. The composite material of any preceding claim, further comprises:

at least one thermal protection layer disposed under the first shielding layer opposite of said metal containing layer.

4. The composite material of any preceding claim, wherein the first shielding layer comprises thermoplastic polymers, wherein the thermoplastic polymers are doped with one or more chemical compounds.

5. The composite material of claim 4, wherein one or more chemical compounds comprise at least Boron (B) and/or Lithium (Li).

6. The composite material of any preceding claim, wherein the composite material comprises one or more metal containing layers, said one or more metal containing layers comprise metals or metal oxides with atomic number (Z), wherein (Z) is from 22 to 30 and/or 72 to 79.

7. The composite material of claim 6, wherein the atomic number (Z) is 13 for metals or metal oxides of at least two metal containing layers.

8. The composite material of claim 6 or 7, wherein said one or more metal containing layers comprise at least one metal or metal oxide with the atomic number (Z) is from 72 to 79, wherein said metal containing layer is positioned between at least two other metal containing layers of lower atomic number (Z).

9. The composite material of claims 6 to 8, wherein each metal containing layer has a thickness from 1mm to 30 mm.

10. The composite material of any preceding claims, wherein each layer is adapted to merge into each other layer forming the composite material as a single structure.

11. A composite shielding material, wherein the composite shielding material comprises the composite material according to any one of claims 1 to 10.

12. A method for providing the composite material according to any of claims 1 to 10, comprising:

generating a model of the composite material in a virtual environment, wherein the model comprises a digital representation of a composite material comprising: a first shielding layer, at least one metal containing layer over the first shielding layer, and a second shielding layer over said at least one metal containing layer;

providing a composition of the composite material to a device;

generating the composite material based on the model using the composition, wherein the composition is combined to form layers of the composite material; and

removing imperfections or defects on the composite material in accordance with the model based on one or more inputs.

13. The method of claim 12, wherein said generating the composite material based on the model using the composition further comprising: merging the composition in 0º warp and 45º - 90º fill direction to produce at least one layer of the composite material, wherein the composition comprises carbon fibres and thermoplastic polymers.

14. The method of claim 12 or 13, wherein the composition comprises thermoplastic polymers that are cross-linked prior or after to generating the composite material according to any one of claims 1 to 10.

15. The method of claims 12 to 14, wherein the generated model further comprises composite material or composite shielding material according to any one of claims 1 to 11.

16. A method of using the composite material of any one of claims 1 to 10, the method comprising: using the composite material to shield radiation exposure received by a spacecraft, and/or as part of construction material for a spacecraft, a spacesuit, a space habitat, or a combination thereof.