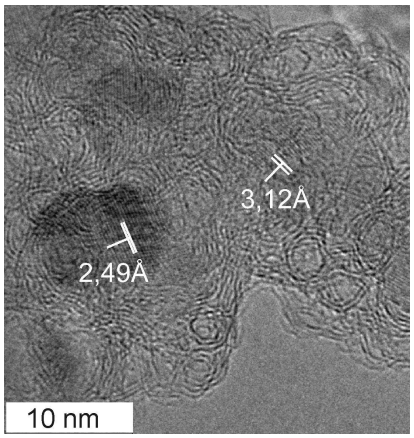
Core-shell nanostructures (Si@C) — Product Data Sheet

Description:
Black powder with a brown tint consists of a silicon core and a carbon shell (pure carbon, in allotropic form - graphene, small flakes), bulk density 30 mg/ml, average particle size ~50-60 nm. The chemical formula of the powder includes only silicon and carbon, structured as a carbon shell around the silicon core. Silicon to carbon ratio - 1:2 (X-Ray Diffraction (XRD) analysis: Tongda TD-3500)

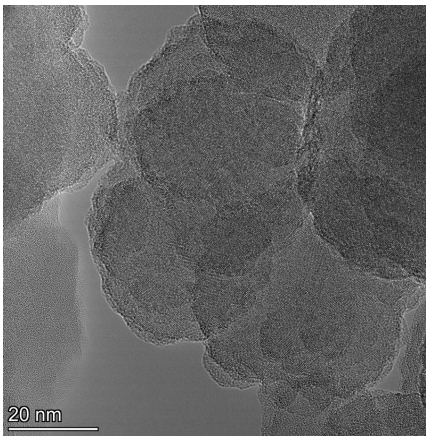
Si@C nanopowder can be used in the production of anode material for Li-ion batteries used for:

- power supply for hybrid and electric vehicles
- robotics and autonomous devices.
- uninterruptible power supply systems;

Si@C TEM images



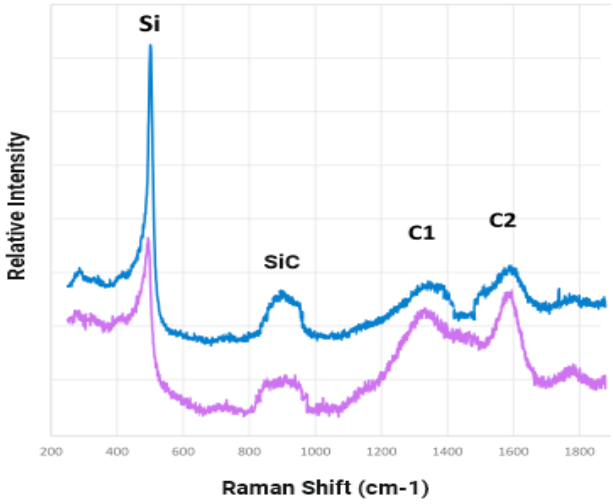
TEM image N°1 of **Si@C**



TEM image N°2 of **Si@C**

Nanoparticles of Si crystallites coated with graphene layers. Nanoparticles have crystalline cores and a carbon shell. Interplanar distances of 3.12 and 3.06 A˚ correspond to the interplanar distance of silicon (d_{111}), while 2.49 and 2.5 A˚ correspond to the Interplanar distance of silicon carbide (d_{111}).

Raman Spectroscopy [2 samples]



Silicon peaks (500 cm−1), silicon carbide peaks (920 cm−1), and the so-called C1 (1340 cm−1) and C2 (1590 cm−1) peaks, which correspond principally to sp2 -hybridized carbon

Features and Benefits:

- Si@C is an appropriate anode material for use in lithium-ion batteries (LIBs) because of its structural firmness, high electronic conductivity, low diffusion barrier, and high storage capacity.
- A carbon shell formed from graphene sheets does not obstruct the access of lithium ions to silicon but keeps a silicon core from breaking down in charge-discharge cycles.
- The silicon-carbon composite material demonstrates a stable cyclable capacity of 400-450 mA · h/g at a current density of 0.05 and 2 A/g, thus exceeding considerably the capabilities of graphite anodic materials.