Preparation of Graphite doped nanocomposites (Starene®)

Starbon® technology allows the production of Starene® - a carbon graphite composite monolith for use as a supercapacitor. See Case Study VII. Importantly, the material's characteristics lead to improved conductivity as a result of a nano-graphite particle stacking phenomenon that stems from helical polysaccharide interaction and incorporation.

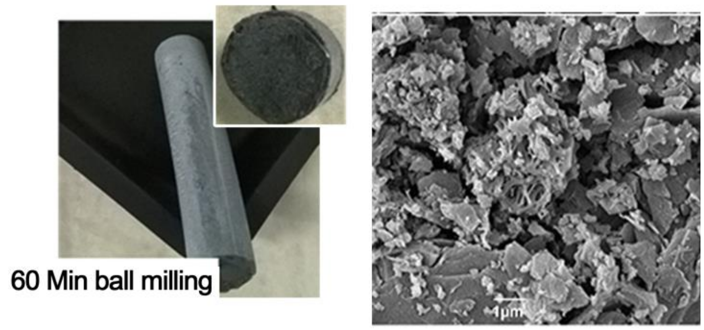

Figure 1: The graphite-starch monolith carbonised at 800

A special technique has been developed to disperse graphite in a carbonaceous material. The increased graphite dispersion is shown to be the result of consecutive ball milling microwave assisted gelation, and carbonisation treatment. The carbonisation temperature plays the most important role dispersing the large (up to 10 μm) graphite flakes presented in Starene®200 to small (40nm) graphite nanoparticles at elevated temperature around 800^{0}C (Figure 2). Furthermore, throughout these treatments a strong interaction between the graphite particles and the underlying, developing, carbonaceous material is forged, partially delaminating and reducing the size of the graphite and even merging the flakes into the carbonaceous structure (Figure 3).

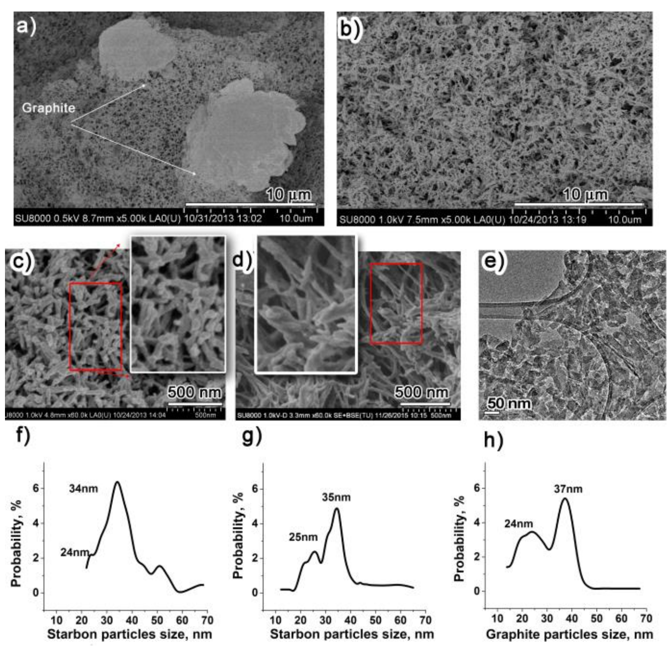

Figure 2: a) SEM of Starene®200-G20, b) SEM of Starene®800-G20, c) and d) are Hi-Res SEM images of the mesoporous carbons prepared at 800^{0}C with 0 and 20% graphite, whilst e) is a TEM image of the 20% sample; f), g) and h) are particle size distributions derived from the images shown in c), d) and e) respectively.

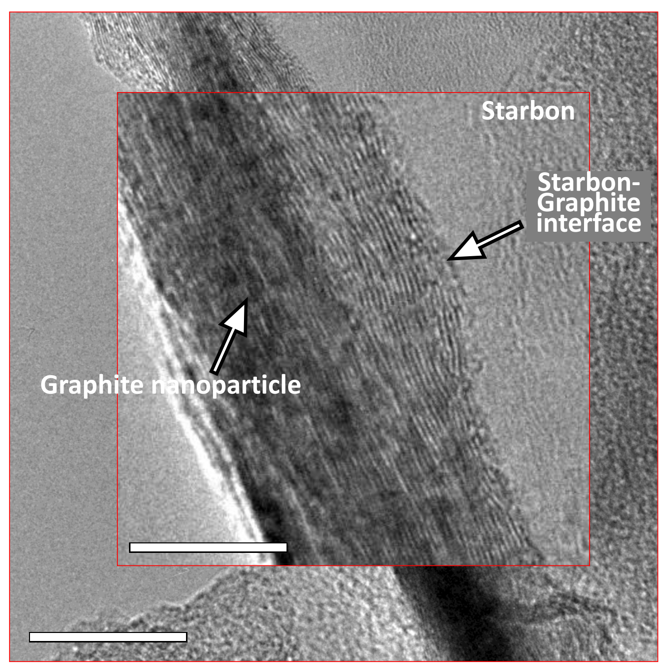

Figure 3. HTEM of the carbonaceous-material-graphite nanoparticle interface.