

Supporting Information

Tuning Electrical Conductivity of Inorganic Minerals with Carbon Nanomaterials

Anton A. Kovalchuk¹ and James M. Tour^{1,2,3}*

¹Department of Chemistry, ²Department of Materials Science and NanoEngineering,

³Smalley Institute for Nanoscale Science and Technology, Rice University, 6100 Main Street,

Houston, Texas 77005, USA.

**Email: tour@rice.edu.*

Experimental

Pellet four point probe

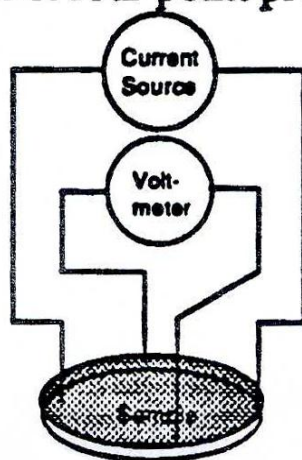


Figure S1. Diagram of the 4-probe setup for measuring electrical conductivity of the pelletized powder samples

A custom-built 4-probe cell designed for compressed powder samples (pellets) with 13 mm diameter and 0.52 mm height was used for the electrical conductivity measurements. The sample pellets in the 4-probe cell were covered tightly with a thick plastic cover plate that was attached to the cell with the set of screws so that the samples were fixed in the compressed state to ensure reproducibility of the measurements. The samples were compressed manually. Approximately 0.2 g of the compressed was used for each measurement. The electrical conductivity (in S/cm) was calculated from the resistance using the following eq:

$$\sigma = \ln 2 / (3.14 \cdot R \cdot h),$$

where R is the measured electrical resistance (Ohm) and h is the pellet thickness (0.052 cm).

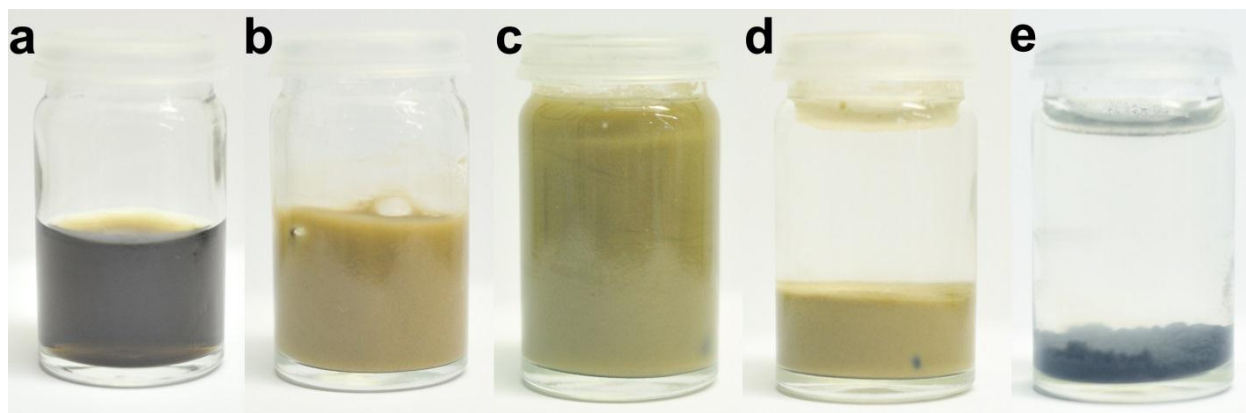


Figure S2. Pictures of the (a) original GO solution (1 mg/ml), (b) barite dispersed in 10 ml of water by stirring, (c) freshly mixed barite and GO solution, (d) barite/1 wt% GO composite precipitated after 60 min of stirring, (e) barite/1 wt% GO-r composite after 60 min of chemical reduction with hydrazine hydrate

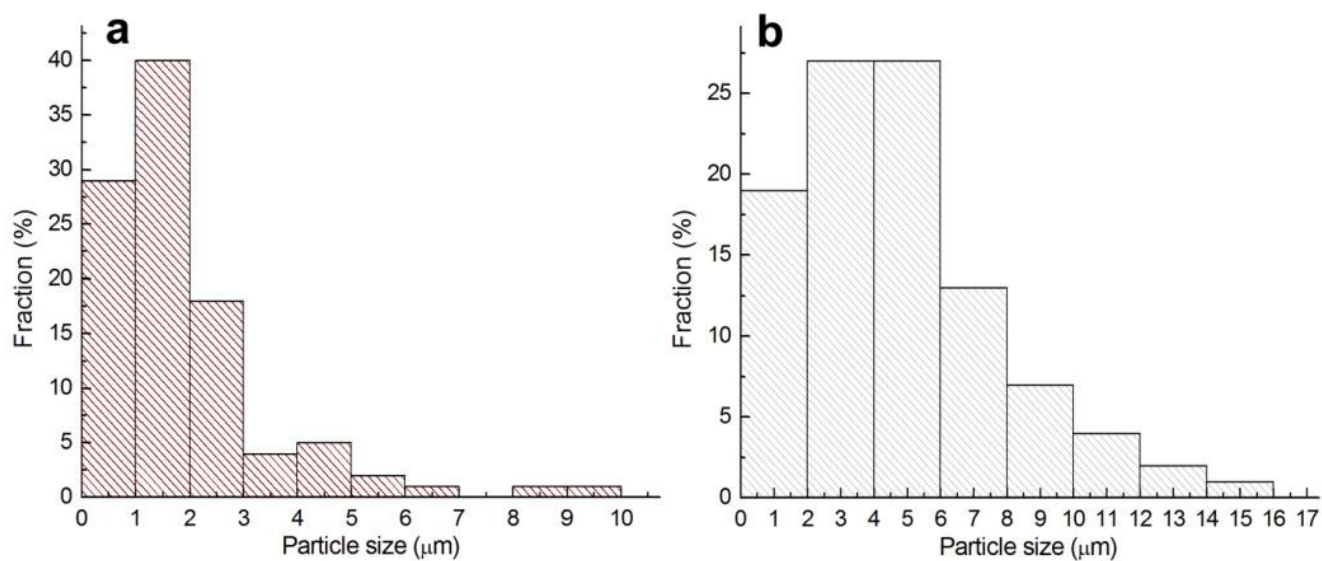


Figure S3. Size distribution histograms for the (a) barite particles and (b) calcium carbonate particles

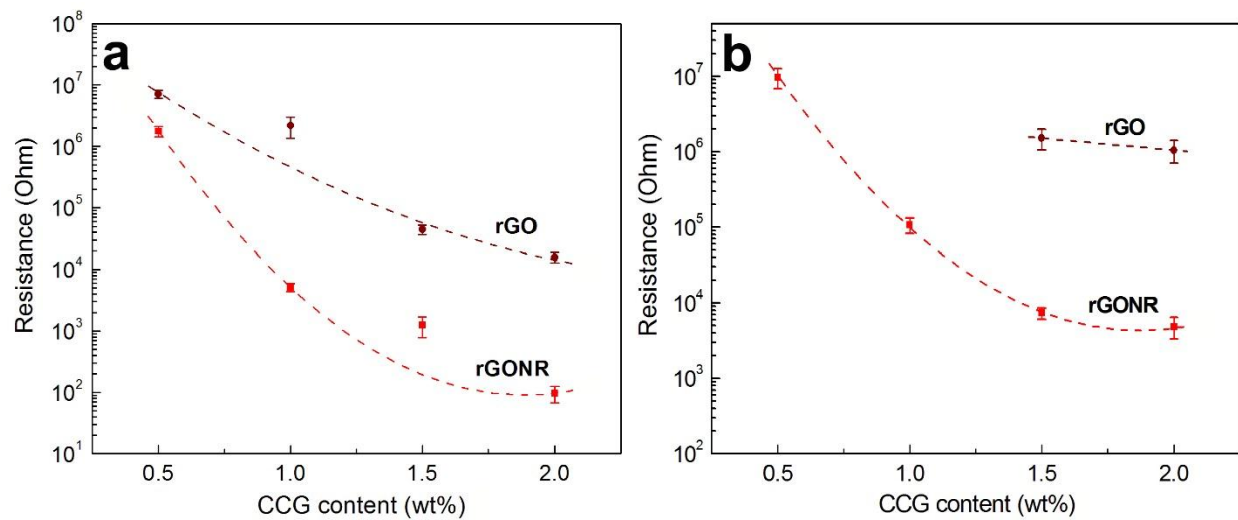


Figure S4. Electrical resistance of the (a) barite/CCG and (b) CaCO₃/CCG hybrids