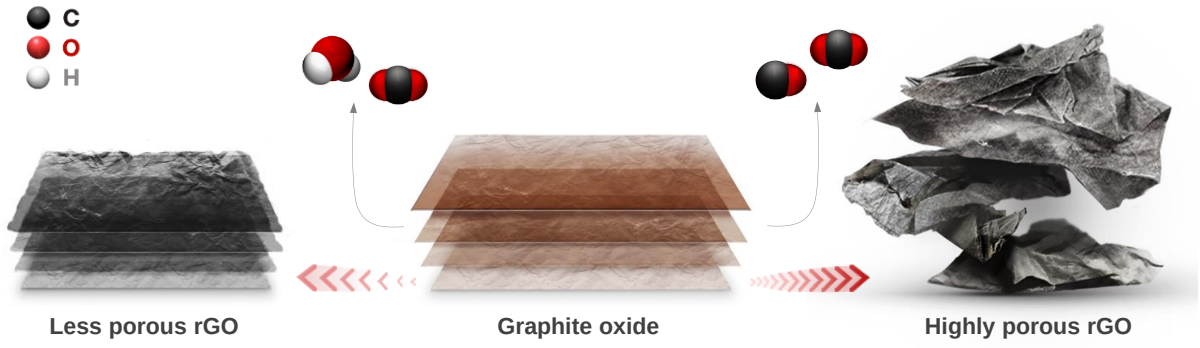
Hiden Reference: AP0449
Hiden Product: HPR-20 QIC Real time Gas Analyser

The effect of heating rate on porosity production during the low temperature reduction of graphite oxide

Thermally reduced porous graphite oxide (TH-rGO), prepared by thermal reduction, is an emerging promising candidate material for use in energy and environmental applications. The effects of thermal reduction conditions on the evolution of pore characteristics in TH-rGO and the kinetics of thermal reduction are not well understood. Therefore a study was undertaken of the correlation of the thermal conditions with the evolution of the porosity in TH-rGO and the kinetics of thermal reduction. The heating rate, rather than thermal conditions, plays a crucial role in the evolution of porosity during the thermal reduction of graphite oxide at low temperatures. Higher heating rates increase the porosity of the TH-rGO. A slow heating rate facilitates the evolution of H_2O and CO_2 whereas a higher heating rate releases CO_2 and CO gases with the concurrent development of a folded and crumpled morphology, investigated by using mass spectroscopy (HPR-20; Hiden Analytical). More importantly, the reduction time and temperature are found to be dependent on the heating rate. High heating rates shortened the reduction time (less than 5 min in ≥ 10 °Cmin^{-1}) with lower reduction temperature (below 140 °C), whereas higher temperatures and longer times were required to complete the reduction reaction at low heating rates. With these results it may be possible to rationally design the pore textures and chemical structure of the chemically-reduced graphite oxide to fit a variety of end-uses, particularly in electrochemical energy storage, adsorbents, and conductive/reinforced carbon nanocomposites.



Representative figure. *Schematic representations of the creation of a porous structure as a function of the heating rate during the low-temperature reduction of GO.*

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