

THE NANOSTRUCTURE PARADIGM FOR DESCRIBING CARBON STRUCTURE, INTERPRETING ITS REACTIVITY AND QUANTIFYING ITS TRANSFORMATIONS

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Nanostructure – structure on the nanoscale has always existed. Yet recognition of its importance in governing carbon’s chemical reactivity is comparatively recent. Nanostructure is generally described by the parameters of lamellae length, curvature (or tortuosity) and separation distance, measured perpendicular to the graphene segments. High resolution microscopy is necessary to access these scales with image analysis algorithms used to extract the spatial metrics. Aided by automated processing codes, distributions of each metric can be accumulated for their statistical description. Since 2004, nanostructure as a subject has appeared in more than two dozen papers. These studies have addressed nanostructure a) characterization, b) impact upon (carbon) oxidation, c) dependence upon molecular precursor and d) dependence upon combustion (i.e. formation) conditions, along with other related studies. Moreover nanostructure is not immutable. Partial oxidation, electron-beam exposure and high temperature treatment can change each metric. The construct of nanostructure provides a path for quantification of these changes. Therein nanostructure is a broadly applicable paradigm for description of carbon structure and its physical changes. This presentation will provide a brief review of nanostructure in these contexts. Future needs will be suggested.