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Insights into organic chemistry at extreme conditions through evaluation of recovered carbon products produced by detonations MILLICENT FIRESTONE, SOKHNA DIOUF, JOHN BOWLAN, Los Alamos National Laboratory, SOENKE SIEFERT, Argonne National Laboratory — The direct evaluation of chemical reactions that occur behind the detonation front is challenging due to the extreme conditions produced. Thus, details of the primary carbon fragments (i.e., reactive species) generated by the detonation of an explosive and the operative synthetic pathways for carbon framework extension are not well described. Late time events, such as framework coalescence into nanoparticles and nanoparticle assembly into mesoscale architectures is also not well understood. To further advance our understanding of the chemical and physical events occurring post-detonation, we have sought to evaluate the carbon products recovered from a range of explosives (e.g., nitromethane). Post-event X-ray scattering on the unpurified recovered soot determines nanoparticle morphology and mesoscale aggregate architecture. Isolation, fractionation, and purification of all carbon products contained within the soot are achieved through a multi-step separation protocol. The separation scheme allows for recovery of both soluble (e.g., fullerenes and diamondoids) and nanophase carbons. Based upon these studies, operative mechanisms regulating framework growth are postulated and tested through adjustment of detonation conditions (closed chamber atmosphere and CJ conditions). Understanding the correlation between detonation conditions and carbon product formation is important for achieving greater accuracy in predicting explosive performance.

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