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Kinetics of carbon clustering in detonation of high explosives: Does theory match experiment? KIRILL VELIZHANIN, ERIK WATKINS, DANA DATTELBAUM, RICHARD GUSTAVSEN, TARIQ ASLAM, DAVID PODLESAK, MILLICENT FIRESTONE, RACHEL HUBER, BRYAN RINGSTRAND, Los Alamos National Laboratory, TREVOR WILLEY, MICHAEL BAGGE-HANSEN, RALPH HODGIN, LISA LAUDERBACH, TONY VAN BUREN, Lawrence Livermore National Laboratory, NICHOLAS SINCLAIR, PAULO RIGG, Washington State University, SOENKE SEIFERT, THOMAS GOG, Argonne National Laboratory — Chemical reactions in detonation of carbon-rich high explosives yield carbon clusters as major constituents of the products. Efforts to model carbon clustering as a diffusion-limited irreversible coagulation of carbon clusters go back to the seminal paper by Shaw and Johnson. However, first direct experimental observations of the kinetics of clustering yielded cluster growth one to two orders of magnitude slower than theoretical predictions. Multiple efforts were undertaken to test and revise the basic assumptions of the model in order to achieve better agreement with experiment. We discuss our very recent direct experimental observations of carbon clustering dynamics and demonstrate that these new results are in much better agreement with the modified Shaw-Johnson model. The implications of this much better agreement on our present understanding of detonation carbon clustering processes and possible ways to increase the agreement between theory and experiment even further are discussed.

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