This work investigates the use of nanoporous carbon as the primary component of a new composite energetic nanomaterial. The porous structure is filled with an oxidizing agent and the mechanical properties are provided by the carbon skeleton itself. This energetic nanomaterial is expected to combine the promising features of a nanoscale mixture and an optimal oxygen balance while avoiding the obstacles which have hampered the progress toward large-scale practical application of other energetic nanomaterials, like very expensive synthesis processes or toxic and environmental issues. Furthermore, it has been shown that the use of carbon nanomaterials in energetic compositions can greatly improve their thermal stability and sensitivity and those benefits are likely to be provided by nanoporous carbon as well. Its textural properties and surface chemistry can moreover be finely tuned to the application, allowing energetic nanomaterials based on nanoporous carbon to be investigated as potential insensitive and high-performance rocket propellant or high explosive.

In this work, the adsorption capacity and adsorption kinetics in the liquid phase of inorganic oxidizer salts in different micro- and mesoporous nanoporous carbons is investigated. It is subsequently demonstrated that the adsorption of oxidizer salts from concentrated solutions leads to an energetic nanomaterial with a fuel-to-oxidizer ratio close to being stoichiometric. The energetic character of the obtained material is experimentally demonstrated and its potential applications are experimentally investigated. The influences of the textural properties and surface chemistry of the pristine nanoporous carbon are discussed.