Micronization of High Energetic Material using Gas Antisolvent Process

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The preparation of micro- and nanostructured particles has recently drawn considerable attention. To design small particles, several conventional methods have been used such as milling, grinding, crushing, spray drying and recrystallization from liquid solution. However, they are not suitable for treating high-energy materials which are very sensitive to the heat and impact. As an alternative to these techniques, supercritical fluid processes are currently used for the preparation of energetic materials. Among various supercritical fluid recrystallization processes, Gas Anti-Solvent (GAS) process is used since it has been known that it can tune the particle size and size distribution, and morphology by varying the process parameters.

In this study, we report on the GAS recrystallization of cyclotetramethylenetetranitramine (HMX) from γ-butyrolactone solution. In particular, we investigate the effect of operating parameters, namely CO_2 addition rate, temperature, initial solution concentration, and stirring rate on product properties. The recrystallized HMX are analyzed with various analysis methods such as FT-IR, FE-SEM, PSA and DSC in order to evaluate the quality and performance of the product.