Tunable continuous production of RDX from microns to nanoscale using polymeric additives

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PII: S1385-8947(16)30051-1
DOI: http://dx.doi.org/10.1016/j.cej.2016.01.083
Reference: CEJ 14702

To appear in: *Chemical Engineering Journal*

Received Date: 12 November 2015
Revised Date: 19 January 2016
Accepted Date: 23 January 2016

Please cite this article as: F. Pessina, F. Schnell, D. Spitzer, Tunable continuous production of RDX from microns to nanoscale using polymeric additives, *Chemical Engineering Journal* (2016), doi: http://dx.doi.org/10.1016/j.cej.2016.01.083

Tunable continuous production of RDX from microns to nanoscale using polymeric additives

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Abstract

The versatility of the Spray Flash Evaporation (SFE) has been extended within the introduction of solid and viscous polymers in solvent. Those polymers are food additives namely polyvinylpyrrolidone (PVP) and polyethylene glycol (PEG); both additives were successfully used to control crystallization steps, thus the particle size and shape of hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX). The role of PVP as nucleation and growth inhibitor allowed the formation of spherical RDX particles with an average size of 160 nm; we found that only 1 wt% of PVP per gramme of RDX is needed to reach that size and further addition reduces only the dispersion. The PEG triggered the nucleation of RDX with a low rate and so promoted the growth of RDX particles up to 5 microns. Despite a lower thermal stability, the synthesized energetic composites exhibit reduced sensitives towards electrostatic discharge, friction and impact.

Keywords: Nanocrystallization, RDX, PVP, PEG, Spray flash

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