511b Optimization of the Selection of the Extruder Type, Geometry and Operating Conditions for the Processing of Nano-Energetic Materials Based Fem Analysis of the Process

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The selection of the type of extruder (co versus counter rotating, or tangential versus fully intermeshing), the particular processing geometry of the extruder and the operating conditions for the processing of a particular energetic formulation, especially involving nanoparticles, is a sensitive process which can generate an incident if the selection is not carried out properly. FEM based mathematical models of the coupled flow and heat transfer occurring in the twin screw extrusion geometry can be employed to select the optimum process, geometry and conditions in conjunction with the rheological material functions and the thermal properties of the energetic formulation. Here such mathematical models are presented along with a new flexible extrusion platform “universal” used for process development and model validation. This new extrusion platform allows co and counter rotation of the screws as well as any degree of intermesh between the two screws (from fully-intermeshing to tangential) for the twin screw as well as the facility to use a single screw geometry. The design and modeling associated with a mini twin screw extruder (the smallest in the World) especially suited for the processing of nanoenergetics will also be reviewed.