524b Rapid Expansion of Supercritical Solution with Solid Cosolvent (Ress-Sc) Process for Particle Formation: Pharmaceutical Nanoparticles

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In conventional RESS process, a solute dissolved in supercritical fluid is rapidly expanded through a nozzle to precipitate the solute as microparticles. The modeling of RESS has shown that the precipitated solute at the nozzle tip is of the order of 5-25 nm in size. However the final particles experimentally obtained are in the order of 800-3000 nm in size, due to growth by coagulation in the expansion chamber. Another difficulty is that most of the pharmaceutical compounds have poor solubility in supercritical carbon dioxide (a fluid of choice). In this work, both challenges are addressed by utilizing a cosolvent that is solid at the nozzle exit conditions. The solid cosolvent (SC) enhances the solubility and provides barrier for coagulation in the expansion chamber. The new process is termed as RESS-SC. RESS-SC concept is demonstrated by producing 50-250 nm nanoparticles of griseofulvin (GF) using a simple capillary nozzle, and solubility enhancement of 28 fold. The SC is removed later removed by sublimation.