The Effect of Anti-solvent Injection Rate on Polymorph Control by Using the Raman Spectroscopy

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The high explosive material used in this study has a higher energy density and oxygen balance than HMX and RDX, which are generally known energetic materials. The high explosive material is known that the explosive power is 14% higher than that of HMX. This is due to differences in molecular structure and arrangement. The 4 polymorphs of α-, β-, ɣ-, and ε-form exist under sufficient conditions and ζ-form exists only at high pressure. Drowning-out method was used. By monitoring the polymorph of high explosive material in real-time using Raman spectroscopy, the induction time during crystallization was confirmed and the first polymorph and final polymorph were confirmed. Through Raman calibration, the concentration in the solution was determined and the supersaturation was calculated accordingly. At the same ratio of solvent and anti-solvent, as the injection rate of the anti-solvent increased, the supersaturation increased, and the large supersaturation induced the formation of small crystals. In addition, it was confirmed that nucleation became faster as the injection rate increased.