Abstract Submitted
for the NEF10 Meeting of
The American Physical Society

Investigating Early Stage Crystal Growth Process Using Blotless Microfluidic Cryo-TEM JINKEE LEE, Brown University, ARIJIT BOSE, University of Rhode Island, ANUBHAV TRIPATHI, Brown University — We study the early stages of calcium carbonate crystal growth using blotless microfluidic chip integrated cryogenic transmission electron microscopy (cryo-TEM). We also explore the interaction of polymer additives on crystal growth process ($CaCl_2$ (0.01M) + Na_2CO_3 (0.01M) (+ polymer additives) $\rightarrow$ $CaCO_3$+2NaCl). Three types of carboxylated hyperbranched polyglycerol were used as the polymer additives for retarding crystallization $CaCO_3$. A blotless microfludic CEVS is newly designed to capture crystal growth process at time scales on .5 to 100 seconds. This computer controlled CEVS removes blotting and relaxation step which generally takes at least 3 second. The chemical reaction can be allowed to occur both on the TEM grid as well inside the microfluidic channel. Our results show that upon mixing $CaCl_2$ and Na_2CO_3 solutions, emulsion like amorphous structure are initially formed. Subsequently, in 1 -2 seconds, these structures decompose into CaCO3-veterite nanoparticles. The polymer additives are shown to retard this crystallization processes even 12 seconds. The crystalline or amorphous diffraction patterns were collected to verify this finding. This new CEVS system can be used broadly to study early time structures in nanoscale systems under the very controlled conditions for chemical, biological and pharmaceutical researches and industries.

Jinkee Lee
Brown University

Date submitted: 01 Oct 2010 Electronic form version 1.4