Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Morphological Control of Melting Gel Materials by Electrospray LIN LEI, JI HYUN RYU, KUTAIBA AL-MARZOKI, DANIEL SULLIVAN, LISA KLEIN, ASSIMINA PELEGRI, Rutgers Univ, JONATHAN SINGER, GABRIELA RODRIGUEZ, Lehman College - CUNY, ANDREI JITIANU, Rutgers Univ — Melting gel materials are fluorosilane polymers that possess glass transition temperatures near room temperature and a consolidation temperature >150C above which they irreversibly dehydrate into silica glass. Because of this, they can be processed as a thermoplastic liquid into a desired form and then converted into a permanent structure. In this study, we deposit melting gel materials by electrospray in order to investigate the kinetics principles of different experimental conditions affect the final morphologies of melting gel films. Electrospray is an ideal method for the deposition of structured thin films. Due to the electrostatic breakup mechanism, electrospray results in uniform droplets down to hundreds of nanometers. By using dilute loadings, these microdroplets can deliver extremely small quantities of material at a continuous rate. By controlling spray composition, substrate temperature, flow rate, and collection distance, kinetics of solvent evaporation and melting gel consolidation. The results reveal that these can be used to controllably tune surface structure from smooth, to rough, to cellular hard coatings. Further, as the solutions are dilute, sparingly soluble nanoparticles may also be incorporated into the final structures. For example, sacrificial porogenic nanoparticles can add porosity to make highly fractal structures or low density coatings.

Lin Lei
Rutgers Univ

Date submitted: 18 Nov 2016 Electronic form version 1.4