



New technology to investigate  
crystallization on polymer surfaces

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# PARANYMPHS

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DR. YOONSUN YANG



# CRYSTALLIZATION



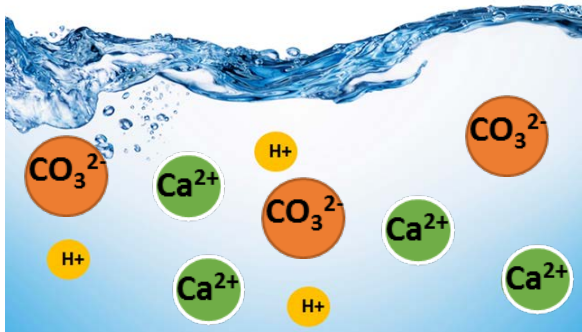
# MINERAL SCALE IN INDUSTRY



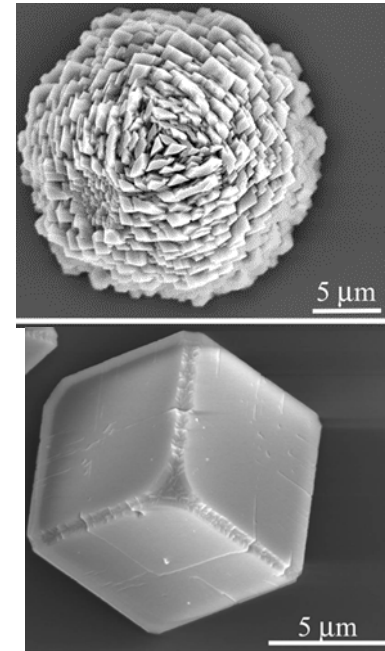
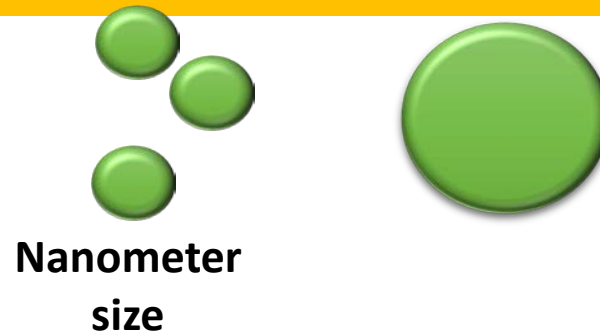
# NUCLEATION AND CRYSTAL GROWTH

NUCLEATION      CRYSTAL GROWTH

SURFACE



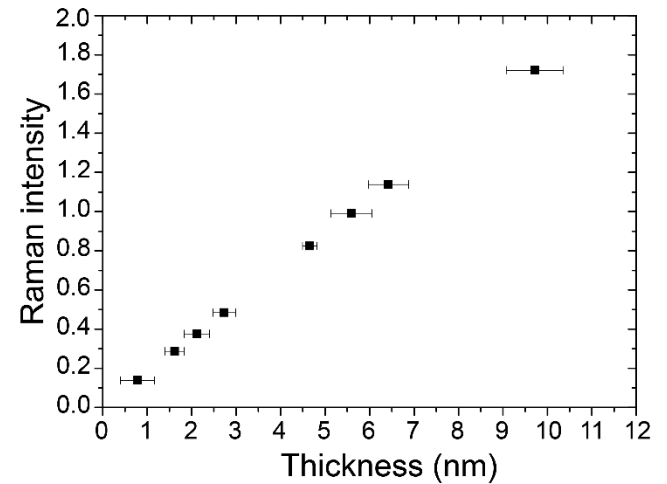
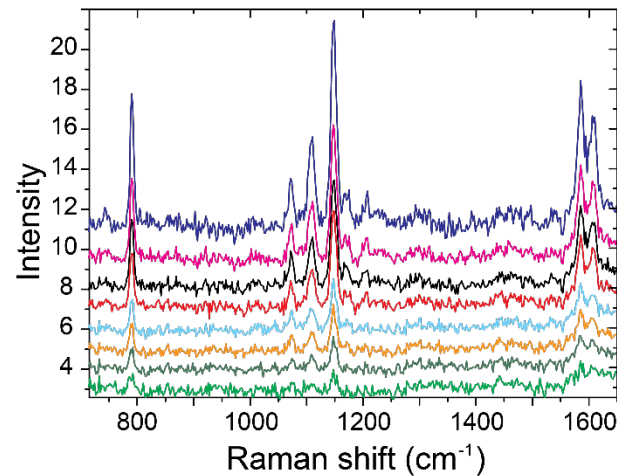
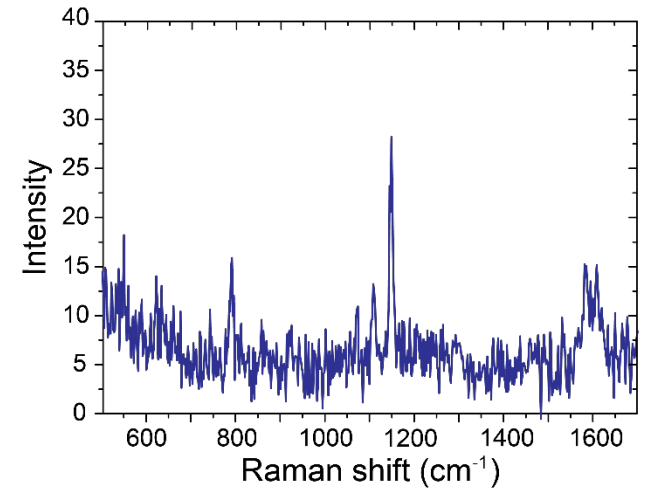
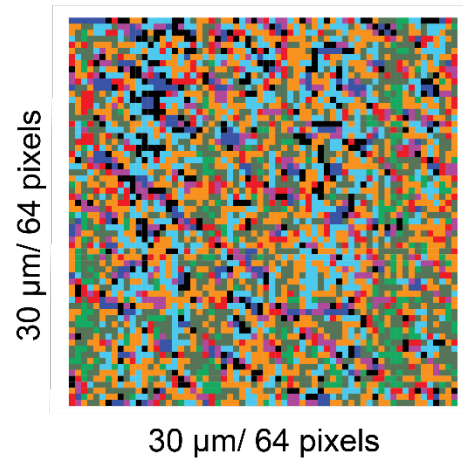
SOLUTION SATURATED  
WITH IONS



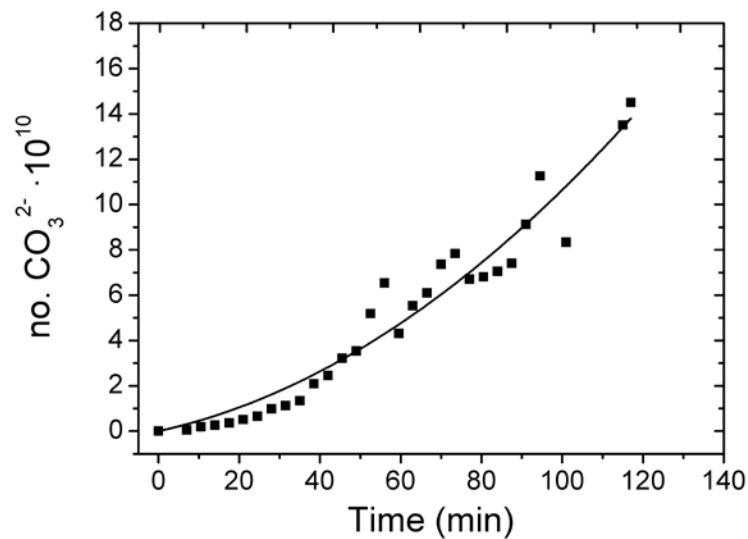
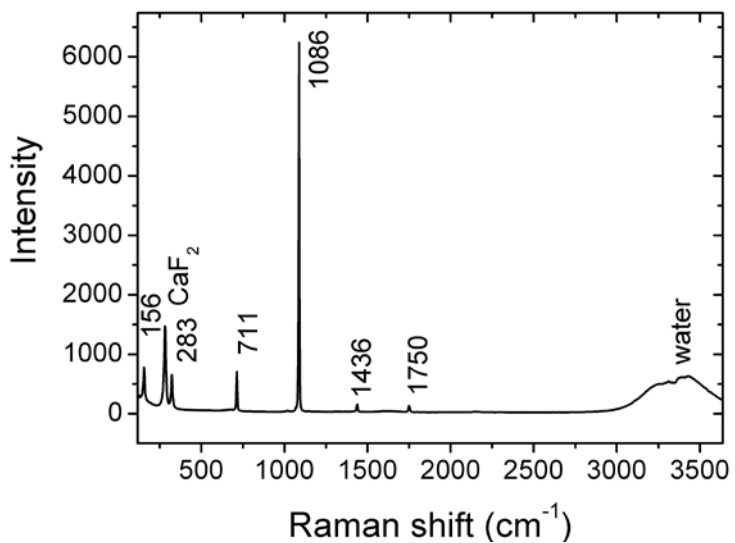
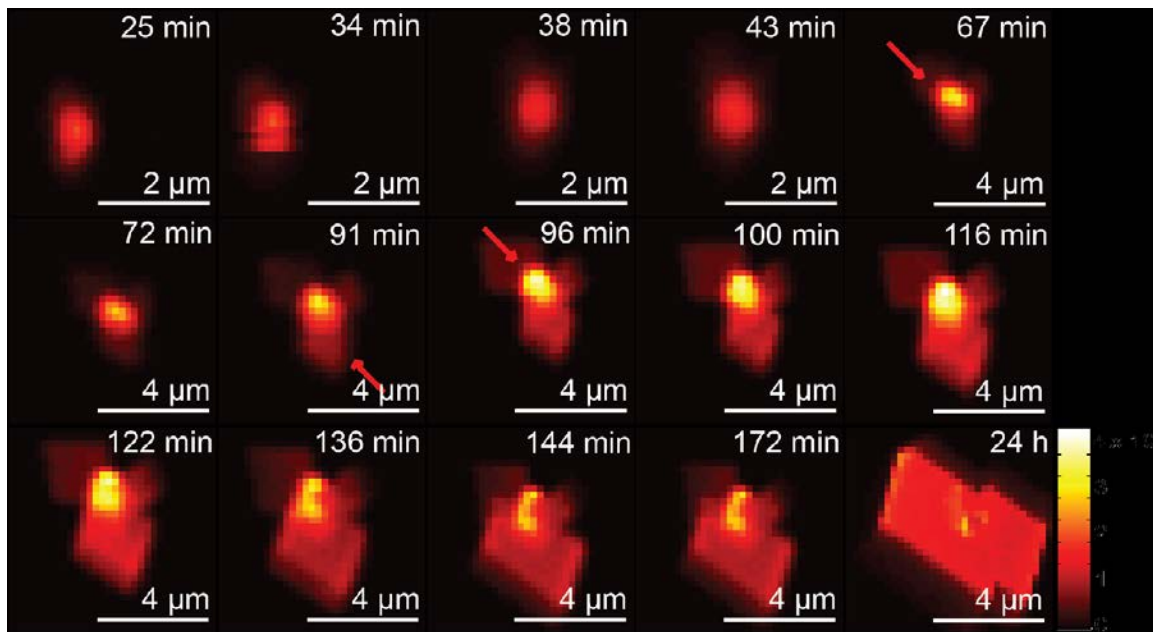
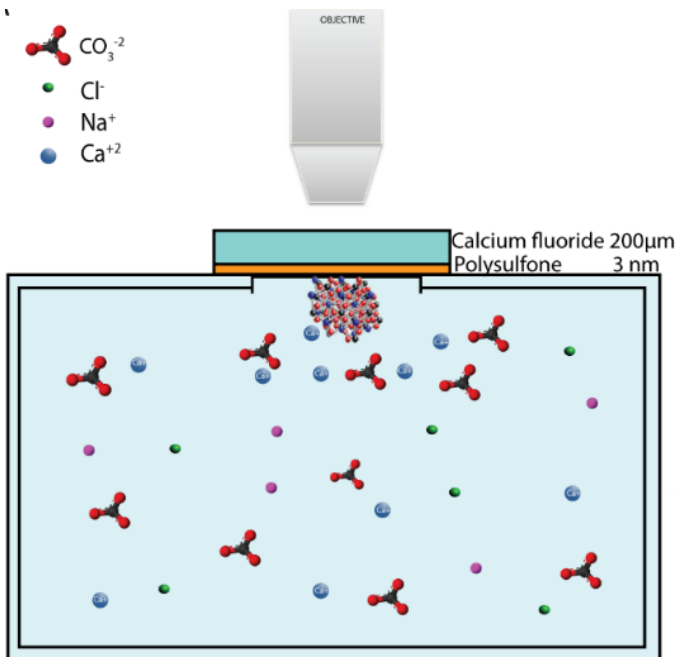
# POLYMER FILMS

## NANOMETER THIN POLYMER FILMS:

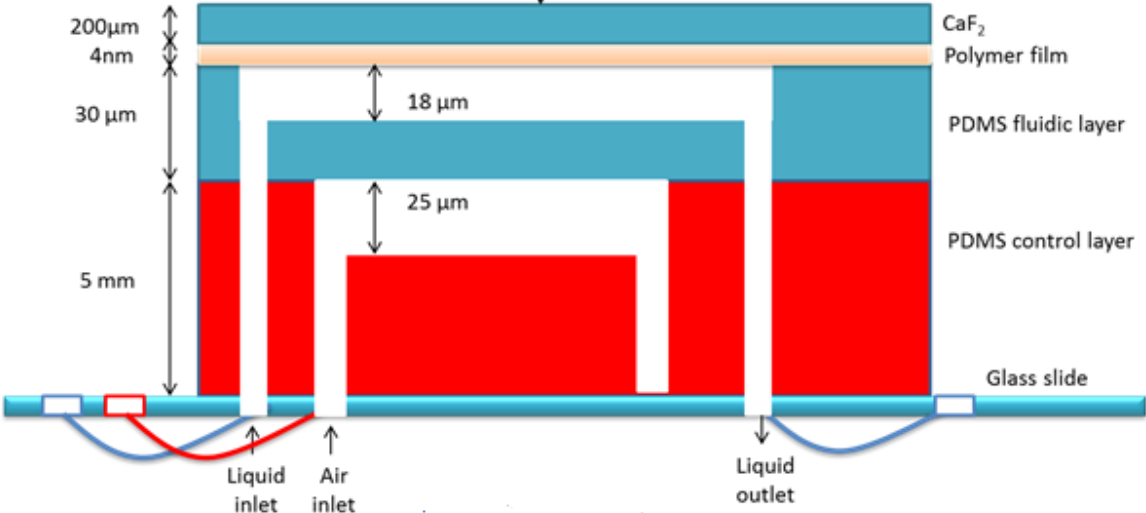
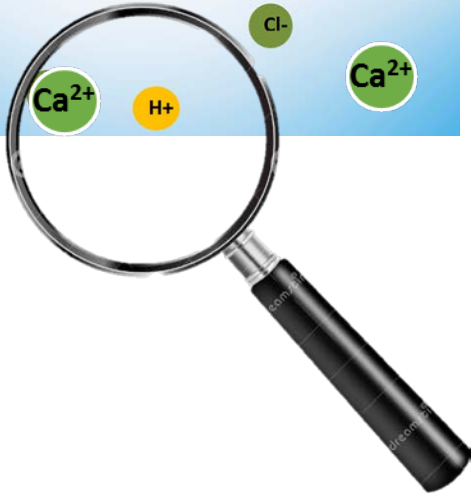
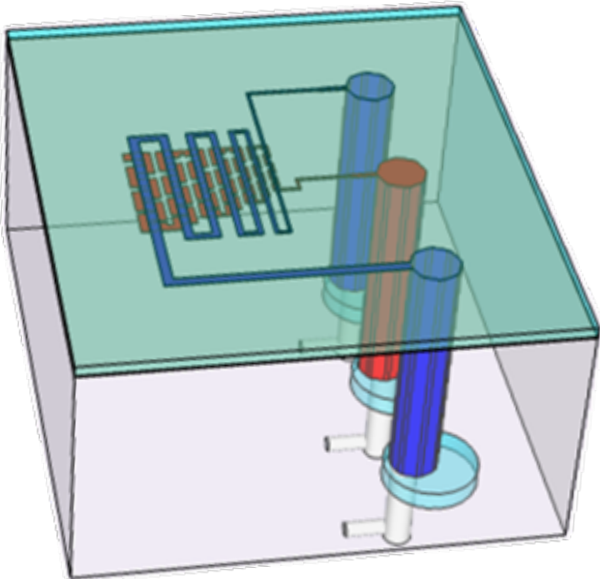
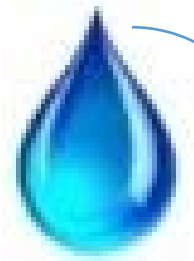
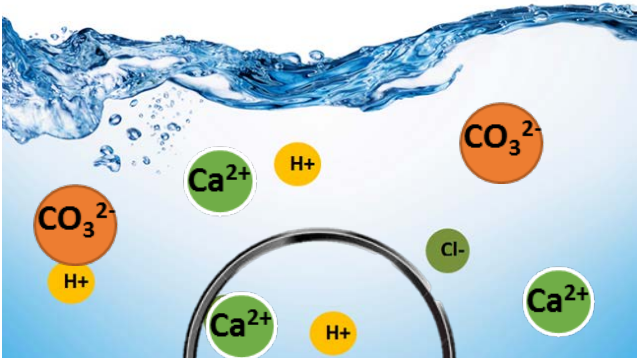
- POLYSULFONE
- POLYSTYRENE
- POLY(P-PHENYLENE OXIDE)



# CRYSTAL GROWTH RATE IN SITU

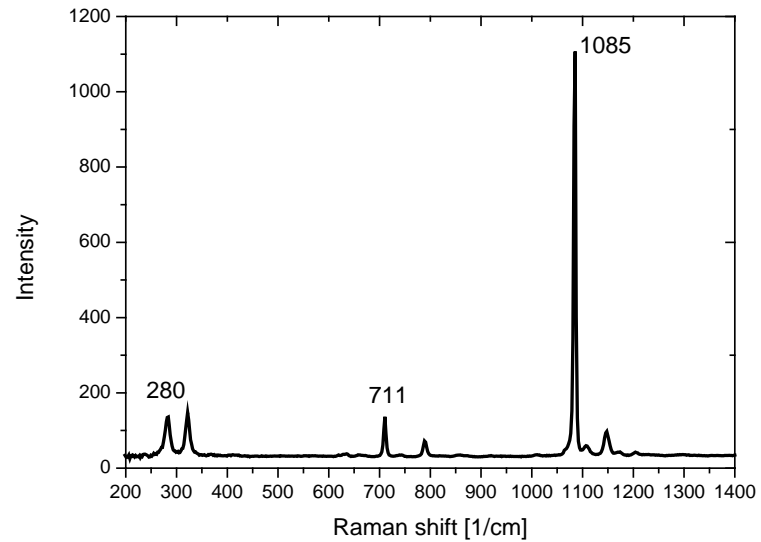
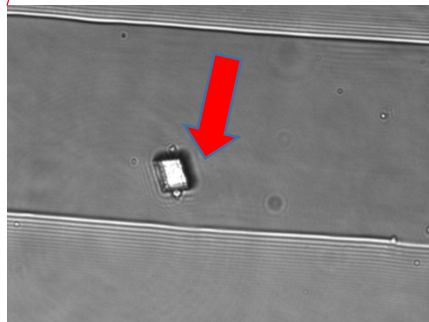
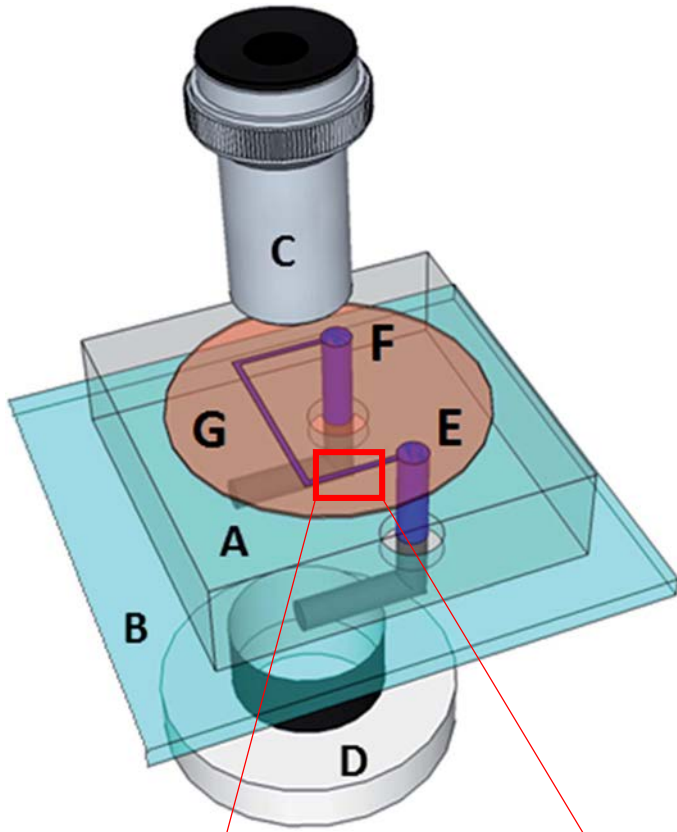


# MICROFLUIDIC DEVICE

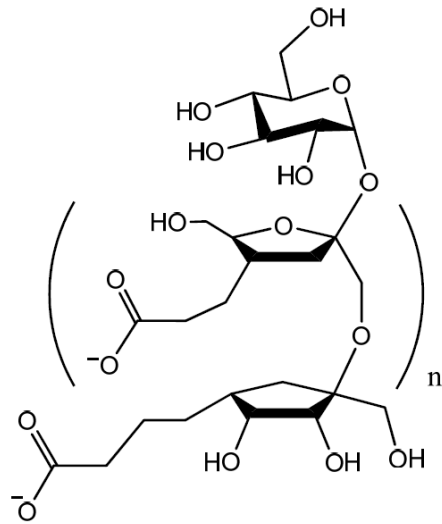




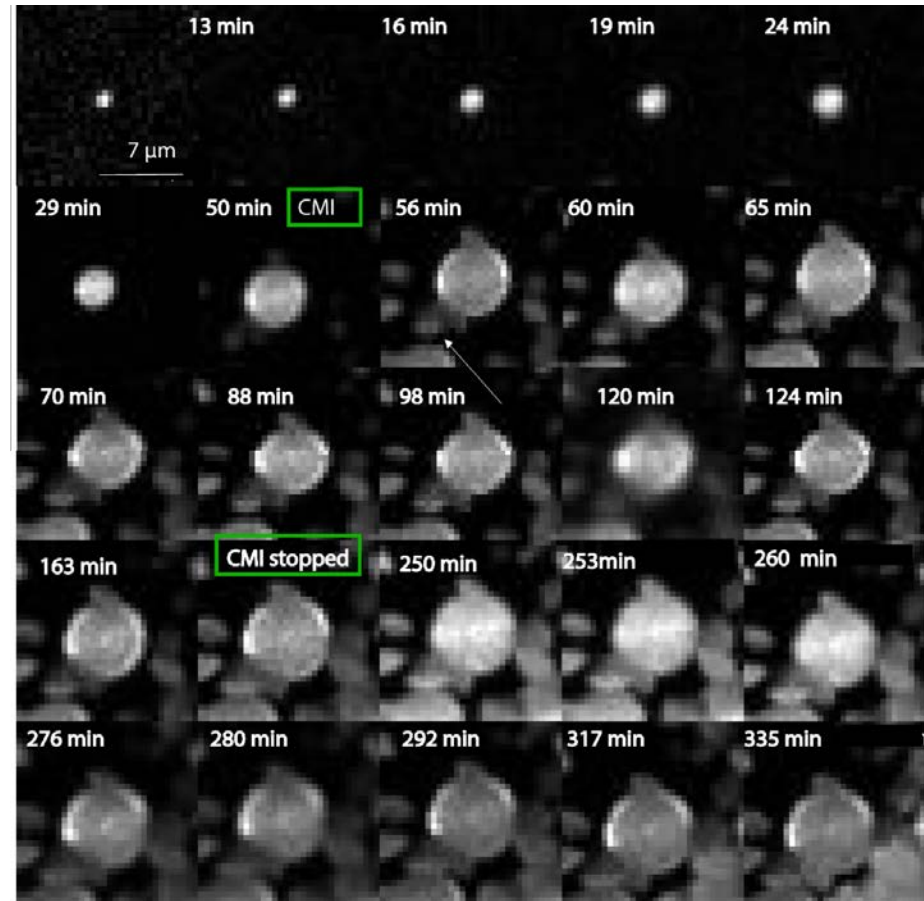
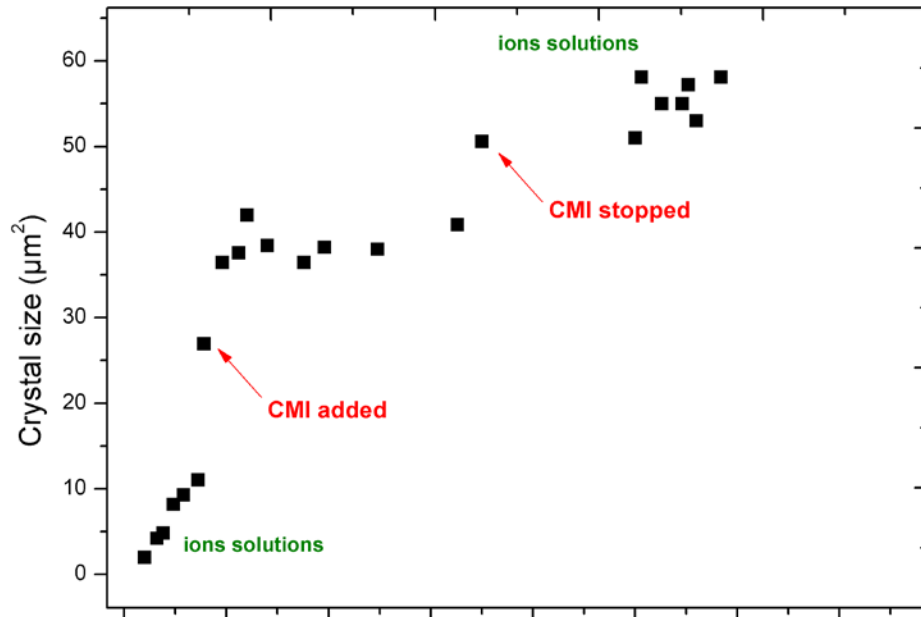
# RAMAN-MICROFLUIDICS



# INHIBITOR INFLUENCE ON CRYSTAL GROWTH



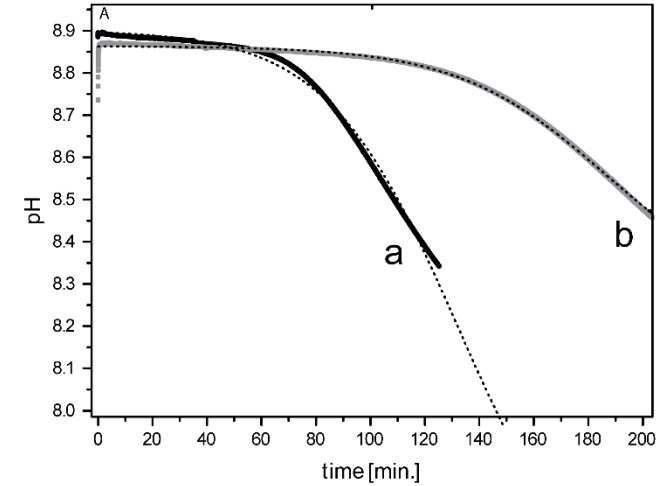
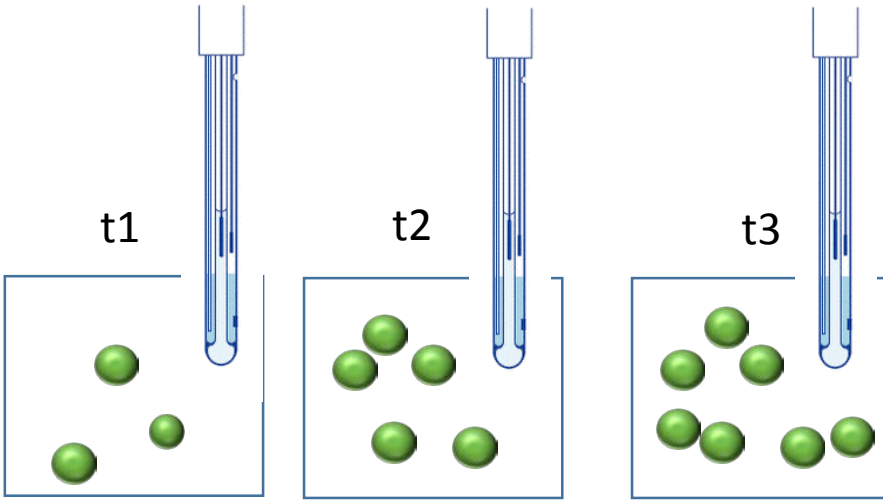
Inhibitor: carboxymethyl inulin



Time lapse images of crystal growth

# NUCLEATION RATE – DOUBLE PULSE

Nucleation



Kinetic profile of mineralization solution

Nucleation quenched

Crystal growth

