

## Unconventional photolithography dictated by reaction–diffusion process

Shin-Hyun Kim<sup>†</sup>

Department of Chemical and Biomolecular Engineering, Korea Advanced Institute of  
Science and Technology

(kim.sh@kaist.ac.kr<sup>†</sup>)

Photolithography has served as the most convenient means to create 2D patterns. Here, we have developed a novel photolithographic method based on reaction–diffusion process to create 3D patterns. During radical polymerization, oxygen rapidly consumes radical and therefore inhibit propagation reaction. Therefore, the spatial gradient of oxygen concentration influences the growth of polymeric structure. When the rate of oxygen–inhibition reaction is comparable with that of oxygen diffusion, the oxygen gradient is spontaneously formed in the UV–exposed region due to the influx of oxygen from the unexposed region. The gradient can be further engineered by employing different sets of boundary conditions for oxygen source. Therefore, growth pathways of polymeric structures can be selected by controlling the boundary conditions, one of which enables the creation of unconventional 3D patterns.