

On-demand drug delivery with a nano porous membrane responding to the electrical stimulus

전금혜, 김진곤*
포항공과대학교
(jkkim@postech.ac.kr*)

Pulsatile drug release, which is one of controlled releases, is required to treat disordered secretion of hormones. The key issue in this area is to develop a smart nanoporous membrane whose pore is controlled by external stimuli. We prepared this membrane by using an anodic aluminum oxide membrane (AAO) and polypyrrole (PPy) by electropolymerization. The pore size was controlled by changing electrochemical state (oxidation vs reduction states). By using in-situ AFM measurement, pore sizes at oxidation and reduction states are 210, and 167 nm, respectively. Accordingly, the flux at the reduction state is reduced compared with that at the oxidation state, which was confirmed by in-situ flux test. We found very good reversibility and very fast responding speed (< 10 s) between two states. The relationship between pore size and flux at two different states could be explained by using Hagen-Poiseuille equation with the assumption of confined isotropic volume change of PPy. Finally, we verified the concept of pulsatile release by using a model drug of FITC-BSA.