# Smart membrane for on-demand drug delivery with electrically controllable nanopore

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Pulsatile drug delivery is an ideal remedy of hormone-related disease and local pain relief of chronic diseases. We fabricated electrically responsive nanoporous membrane based on polypyrrole doped with dodecylbenzenesulfonate anions (PPy/DBS) which was electropolymerized on the anodized aluminum oxide membrane. Open state of pore size was freely tunable as nanometer scale accuracy depending on kind of drugs. On and off states of the pores were reversibly controlled by volume change of PPy/DBS depending on electrochemical state. The actuation of the pore size was experimentally confirmed by in-situ AFM and flux measurement. We also demonstrated successfully pulsatile (or on-demand) drug release demonstrated by using fluorescently labeled protein as model drug. This membrane showed a fast switching time (less than 10 s) and high flux of drug.