Ehsan Shamaeli et al., Pharm Anal Acta 2016, 7:1 (Suppl)
http://dx.doi.org/10.4172/2153-2435.C1.028

OMICS International
conferenceseries.com

8th International Conference and Exhibition on

Pharmaceutics & Novel Drug Delivery Systems

March 07-09, 2016 Madrid, Spain

Electrochemically controlled release of anticancer drug methotrexate using nanostructured polypyrrole modified with cetylpyridinium and release kinetics investigation

Ehsan Shamaeli and **Naader Alizadeh**
Tarbiat Modares University, Iran

A new simple strategy for direct electrochemical incorporation of chemotherapeutic methotrexate (MTX) into conductive polypyrrole (PPy) has been suggested for an electrochemically controlled loading and release system. Electropolymerization of MTX doped polypyrrole yielded poor quality with low efficiency of doping, but a well-doped, nanostructure and very good capacity (24.5 mg g-1) of drug loading has been obtained in the presence of cetylpyridinium (CP) as a modifier. When CP was preloaded onto PPy, the hydrophobic surface of the PPy serves as a backbone to which the hydrophobic chain of the CP can be attached. Also electrostatic interaction between cationic CP with anionic MTX and aromatic interaction between pyridinium head of CP with pyrimidine and pyrazine rings of MTX increases drug doping. Then release kinetics was investigated at various applied potentials and temperatures. Kinetics analysis based on Avrami's equation showed that the drug release was controlled and accelerated by increasing temperature and negative potential and sustained by increasing positive potential. At open circuit condition, the release parameter (n) represented a diffusive mechanism and at applying electrochemical potentials, a first-order mode. Activation energy parameters (Ea, $\Delta G\neq$, $\Delta H\neq$ and $\Delta S\neq$) and half-life time (t1/2) of drug release are also analyzed as a function of applied potential. The nanostructured polymer films (PPy/CP/MTX) were characterized by several techniques: scanning electron microscopy, Furrier transforms Infrared, UV-vis spectroscopy. Overall, our results demonstrate that the PPy/CP/MTX films, combined with electrical stimulation, permit a programmable release of MTX by altering the interaction strength between the PPy/CP and MTX.

Biography

Ehsan Shamaeli has completed his PhD at the age of 28 years from Tarbiat Modares University in Iran. He is studying in a postdoctoral program at Tarbiat Modares University conducting research after the completion of his doctoral studies. He has published 6 papers in reputed journals.

Notes: