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Plasma Deposition of porous silicon and biodegradable thin films for anticancer drugs delivery

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Drug delivery and controlled release devises has been extensively studied in the last decade and are among the most aspiring means of treating diseases where systematic chemotherapy is failing to address. Problems like poor water solubility, low therapeutic index, cytotoxicity and short circulation time can be successfully addressed by means of controlled release and drug delivery.
In this work, we present results of the implementation of nanoporous (np-) and mesoporous (mp-) silicon thin films for the control release of anticancer drug Epirubicin Hydrochloride (Epi HCL). Plasma Enhanced Chemical Vapor Deposition through RF Silane / hydrogen discharges was used for the direct deposition of np-Si thin films while anodization of these films in controlled electrochemical cell of Hydrofluoride:Ethanol:Water (HF:EtOH:H2O) was used for the preparation of mp-Si films.
Furthermore, both np-Si and mp-Si thin films where drug loaded and characterized for the release kinetic of Epi HCL in Phosphate Buffered Saline (PBS) solution via UV-Vis spectroscopy. Epi delivery profiles show efficient encapsulation of the drug in the porous media and control release for times of about 2 hours.
Finally, for further control of the drug release the porous – Epi system was coated with either Silicon Oxide-like (SiOx-like) or Polyethylene Oxide-like (PEO-like) films. These materials were deposited through Dimethoxyethane (DME)/Argon (Ar) and Hexamethyldisiloxane (HDMSO)/Ar RF discharges respectively, and show excellent biocompatibility and biodegradability. The effect of these layers on the release kinetic was studied and compared to the uncoated np- and mp-Si drug loaded surfaces.

Keywords
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control