

**University of Puerto Rico
Mayaguez Campus
Chemistry Department
Departmental Seminar**

**Friday, October 16th, 2015
Q 123 – Abbot
11:30 AM**

**Artificial Photosynthesis, Biosensors, and Drug Delivery Using
Layered Structured Nanomaterials**

by

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We are studying new applications of layered inorganic nanomaterials such as the zirconium phosphates (ZrP). The θ phase of ZrP can be directly ion-exchanged with large metal complexes, producing intercalated phases useful for artificial photosynthesis schemes, water decontamination, amperometric biosensors, and vapo-chromic materials' applications. Recently, we have demonstrated that the hormone insulin and the anticancer drugs cisplatin and doxorubicin, as well as several metallocenes, can be intercalated in ZrP. The intercalation reaction results in nanoparticles with an expanded interlayer distance. UV-vis spectrophotometry, XPS and ³¹P-NMR spectroscopies, and molecular modeling studies indicate that for cisplatin the drug's chloride ligands have been substituted by phosphate groups of the ZrP material. Results of in-vitro drug release as well as cytotoxicity studies with breast-cancer cell lines for both anticancer agents indicate that the use of these materials for cancer treatment could prove to represent a new strategy for nanotherapeutics. Nanoparticles of these materials can specifically target tumor cells by the Enhanced Permeability and Retention Effect. We have recently intercalated neurological agents: carbamazepine and dopamine.