Neurotransmitter's encapsulation on Bipyridinium-functionalized polysilicon microparticles by supramolecular interactions

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Abstract

Neurotransmitters are biomolecules that play a pivotal role in communication between cells. Generally, an imbalance of these neurotransmitter levels could cause psychiatric and neurological disorders [1,2]. The development of effective methods for neurotransmitter's encapsulation is a topic of great importance in neuronanomedicine because of the prolongation of the overall efficiency of the neurotransmitter as well as their delivery in the target area in a controlled way. In parallel, Bipyridinium salts are π-acceptor and redox-responsive molecules that strongly interact with π-donor compounds. These properties have promoted us toward the immobilization of bipyridinium salts ($1{\cdot}4PF_6$- $4{\cdot}4PF_6$) on polysilicon surfaces and microparticles for encapsulating and releasing of catecholamines and indolamines, π-donor neurotransmitters. First, the formation of the supramolecular complex was performed and characterized in solution as proof of concept. Second, the immobilization of bipyridinium salts on polysilicon surfaces and the subsequent neurotransmitter incorporation was corroborated by contact angle measurements. Furthermore, the quantification of neurotransmitter encapsulated and released from the microparticles by reducing the bipyridinium moiety using ascorbic acid was also performed using high-performance liquid chromatography. Thus, the combination of biocompatible microfabricated polysilicon-based devices with bipyridinium salts as hosts for a controllable encapsulation and release of π-donor biomolecules can open new opportunities for the delivery of drugs, whose physicochemical properties difficult their administration.

REFERENCES

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FIGURES

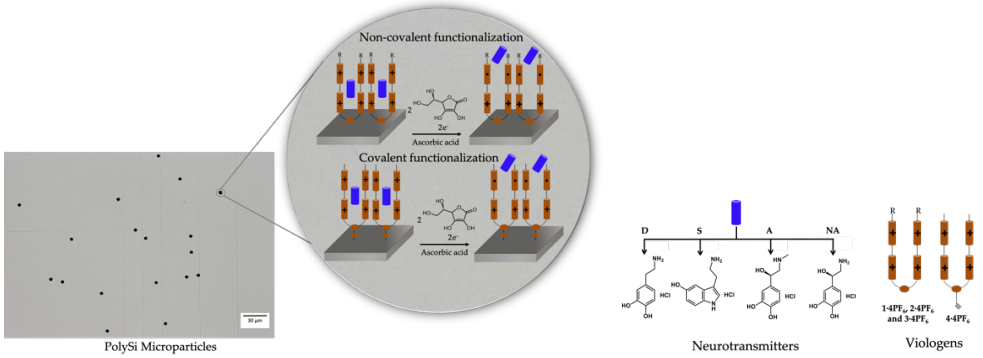

Figure 1: Representation of the covalently and non-covalently functionalized microparticles and their release using ascorbic acid as triggering agent.

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