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Graphene based nanocomposites for optoelectronic applications

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Since the first report on its isolation, a single atomic plane of graphite has become an attractive area of research in physics, chemistry and materials science. Today, graphene is the most attractive nanomaterial not only because it is the thinnest known material in the universe and the strongest ever measured, but also due to its excellent electrical, thermal and optical properties, high-specific surface area, and ease of chemical functionalization which actually helps in tuning its properties. Nowadays, graphene is considered as one of the most promising materials for optoelectronics future at the nanoscale. In addition, graphene's strong interactions with photons and electrons, and chemical functionalization ability could add more functions to photoactive composites. In this talk, we'll share our experience on this nanomaterial to show how it was combined with other nanostructures to generate a white light for LEDs, to detect gas with high sensitivity and selectivity, to convert the solar energy, to be used as photochemical sensor and to generate superparamagnetism for several applications including data storage and medical applications.

Biography

Mohammed Khenfouch has completed his Ph.D. in 2013 from USMBA University. He is the Co-Director of the EPPE. He has published and reviewed several papers in reputed journals and is serving as an editorial board member of Graphene Journal. In addition, he was involved in many international activities such as NanoAfNet communication officer and member of ARSCO. He was the organizer of the first Moroccan conference on nanotechnologies and nanosciences for high school students.

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Microencapsulation of chemotherapeutics into monodisperse biodegradable polymers via electrified liquid jets: simultaneous control of size, shape, and drug release

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Despite significant progress in development of new chemotherapeutic agents and drug delivery methods for brain tumors, malignant gliomas (high grade brain tumor) remains deadly and the median survival is only about a year. During chemotherapy treatment, a high dosage of chemotherapeutic agents needs to be administered in order to penetrate through the blood brain barrier. However, a high dosage not only kills cancer cells but also damages healthy tissues and can cause adverse side effects. It is becoming clear that a major unmet challenge in the field is to develop effective and targeted local delivery of chemotherapeutic agents at the cellular level. Here we report for the first time, a systematic study on (1) formation of 1,3-bis(2-chloroethyl)-1- nitrosourea (BCNU)-loaded Poly(lactic-co glycolic) (PLGA) microcapsules such as flattened microspheres, microspheres, and microfibers using electrojetting techniques and (2) mathematical modeling of BCNU release from PLGA microcapsules to predict BCNU diffusion coefficient. The development of BCNU-loaded PLGA microcapsules with controlled shape and size, high drug encapsulation efficiency, and mathematical modeling of BCNU release profile allows for a more precise control of anticancer agent delivery at the tumor sites. BCNU-loaded PLGA microcapsules (diameters of 1-4 ⌠m) were directly electrojetted on the goldcoated plastic substrates (3cm×2cm). We precisely quantified shape and size of the microcapsules as a function of polymer concentration (1 to 10 wt. % PLGA) and flow rate (0.25 to 1 mL/h) of electrojetting process. Microcapsules were immersed in phosphate buffered saline solution and allowed to release a total of 0.63 mg of BCNU at room temperature. BCNU release profile was quantified with UV spectrophotometry. The BCNU release profile from PLGA microcapsules indicated that about 75% of BCNU was released after 85hrs as a result of drug diffusion and degradation of PLGA microcapsules. Surface area to volume ratio of PLGA microcapsules (flattened microspheres, microspheres, and microfibers) and BCNU to PLGA weight ratio controlled the drug release profile.

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