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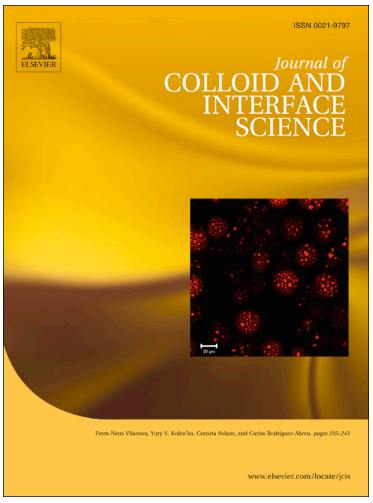

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Controlled release of bupivacaine using hybrid thermoresponsive nanoparticles activated via photothermal heating

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ABSTRACT

Near-infrared (NIR) responsive nanoparticles are of great interest in the biomedical field as antennas for photothermal therapy and also as triggers for on-demand drug delivery. The present work reports the preparation of hollow gold nanoparticles (HGNPs) with plasmonic absorption in the NIR region covalently bound to a thermoresponsive polymeric shell than can be used as an on-demand drug delivery system for the release of analgesic drugs. The photothermal heating induced by the nanoparticles is able to produce the collapse of the polymeric shell thus generating the release of the local anesthetic bupivacaine in a spatiotemporally controlled way. Those HGNPs contain a 10 wt.% of polymer and present excellent reversible heating under NIR light excitation. Bupivacaine released at physiological temperature (37 ºC) showed a pseudo-zero order release that could be spatiotemporally modified on-demand after applying several pulses of light/temperature above and below the lower critical solution temperature (LCST) of the polymeric shell. Furthermore, the nanomaterials obtained did not displayed detrimental effects on four mammalian cell lines at doses up to 0.2