

Drug release systems with functionally graded materials

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Technological advances over the past decades have led to the development of sophisticated drug delivery devices that enable targeting and control of drug release. Recently, more attention has been paid to functionally graded materials (FGMs), a variety of composite materials in which the constitutive properties vary smoothly and continuously from one region to another.

Through a mathematical mechanistic model and a simulation approach, we explore the potential of FGMs as a new class of drug delivery materials, in the attempt to establish whether varying shape material properties can provide an advantage over homogeneous or layered media. We develop a continuum model to describe drug transport within, and release from, a FGM spherical microcapsule. A numerical solution is presented and the differences of functionalized release over a homogenous particle are outlined.