On a ”flux tracking” of drug release processes

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ABSTRACT

A central goal of drug release technology is to combine a diffusing species with a polymeric matrix to obtain a delivery profile adapted to the situation at hand. To achieve this goal two characteristics of the delivery process are studied: the steady state flux achieved by the permeating species and the time required for the flux to attain the steady state. The concept of effective time constant, viewed as the first moment associated with an exponential probability density function, is used to obtain an a priori estimate of the ”flux tracking” including the onset of a steady state. The diffusion of the permeating species is described by a non Fickian model where diffusive and mechanical properties are coupled:

$$\begin{cases} \dfrac{\partial u}{\partial t} = D\Delta u + E\Delta\sigma \\ \dfrac{\partial \sigma}{\partial t} + \beta\sigma = \alpha u + \gamma \dfrac{\partial u}{\partial t}. \end{cases}$$

The dependence of the effective time constant and the steady flux on the properties of both the polymer and the diffusing species can assume a central role in the design of new optimized delivery devices. Several numerical examples that show the effectiveness of our approach are included.

REFERENCES

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