**Mathematical modeling of the hydrolysis process of sucrose**

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**Highlights**

* Hydrolysis process of sucrose
* Michaelis-Menten equation with enzymatic inhibitions
* Mathematical modeling
* Finite Element Method

**1. Introduction**

Simulations of the enzymatic hydrolysis of sucrose were conducted for a Michaelis-Menten kinetic with product and substrate inhibitions in a tubular reactor with axial and radial dispersion.

**2. Methods**

The sucrose enzymatic hydrolysis process was modeled as a laminar flow with average velocity vm inside a tubular reactor of radius R=0.04 m and length L=0.3 m, triggered by a pressure drop between inlet and outlet sections, that generates a velocity component vz (r,t). The transient sucrose concentration and temperature profiles result to be dependent both on the radial and the axial direction: Cs (r, z, t); T (r, z, t). The unsteady equations of mass and energy, including molecular and convective transport, were developed on a differential volume ∆V = 2πr ∆r ∆z, considering a cylindrical coordinate system (r, θ, z).

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The differential equations system was solved numerically by the finite element method.

**3. Results and discussion**

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| Time parametric line graphs of velocity (top), substrate concentration (middle) and temperature (bottom) against radial direction (left) and axial direction (right) | |

**4. Conclusions**

The radial concentration distribution is strongly influenced by the velocity profile, whereas along axial direction the only effect is due to the temporal evolution of the velocity. On the other hand, the temperature increasing for long times derives from the concentration consumption, considering that the reaction is exothermic.

**References**

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