Abreviations and Notations:

Abreviations:

SMF - Submerged fermentation
SSF - Solid substrate fermentation
FPA - Filter paper activity
CMCase - Carboxy methyl cellulase activity
NCIM - National collection of industrial microorganisms
MTCC - Microbial type culture collection
IS - Inoculum size
NL - Nutrient level

Greek Characters:

\( \alpha \) - Thermal diffusivity \( \frac{m^2}{sec} \)
\( \beta \) - Dimensionless quantity \( \beta'q \)
\( \beta' \) - Dimensionless quantity \( \frac{\mu L X_0}{C_p \rho \tau_0} \)
\( \gamma \) - Constant given by \( \Delta H_c - \frac{\Delta H_a}{Y_{cell}} \)
\( \Delta H_c \) - Heat of combustion of cells \( \frac{J}{g_{cell}} \)
\( \Delta H_a \) - Heat of combustion of cellulose \( \frac{J}{g_{cell}} \)
\( \theta \) - Dimensionless time \( \frac{nt}{\Delta} \)
\( \mu \) - specific growth rate \( hr^{-1} \)

Notations:

\( a \) - Constant given by \( \frac{K}{b \sqrt{\mu}} \)
\( a_w \) - Water activity
\( b \) - Constant given by \( \frac{1}{1 - \frac{t_o}{t_{of} - t_{of} + \Delta t}} \)
\( c_p \) - Effective specific heat of the bed \( \frac{J}{g K} \)
h - Natural convection heat transfer coefficient \( \frac{W}{m^3 K} \)

k - Constant thermal conductivity of bed \( \frac{W}{m K} \)

l - Linear dimension (side of fermentor) used in 'h' calculation, m

q - Dimensionless quantity \( \frac{l^2 h}{l} \)

s - Substrate concentration mg/ml

t, \( t_f \) - Time of fermentation.

x - A value given by \( \sqrt{q} \)

A - Cross sectional area of bed m²

\( D_p \) - Average substrate particle size (microns)

L - Total bed height m

\( L_c \) - Critical bed depth m

\( N_{Bi} \) - Biot number \( \left( \frac{h}{k} \right) \)

pH - Initial culture pH

Q - Microbial heat generation rate per unit mass \( \frac{W}{g} \)

T - Temperature °C

\( \bar{T} \) - Dimensionless temperature \( \frac{T}{T_0} \)

\( T_c \) - Critical temperature °C

\( \bar{T}_c \) - Dimensionless critical temperature \( \frac{T_c}{T_0} \)

\( T_0 \) - Initial temperature °C

X - Biomass concentration mg/ml

\( X_{max} \) - Maximum biomass concentration mg/ml

\( X_0 \) - Initial biomass concentration mg/ml

\( \bar{X} \) - Dimensionless biomass concentration \( \frac{X}{X_0} \)

\( Y_{X/s} \) - Biomass yield coefficient \( \frac{X_{cell}}{g_{substrate}} \)

Z - Variable bed depth m

\( \bar{Z} \) - Dimensionless variable bed depth \( \frac{Z}{L} \)