What are the units for pre exponential factor? Where is it documented?

Products: Aspen Plus
Last Updated: 03-Nov-2020
Versions: Multiple, V7.1, V11.0, V8.0, V8.2, V10.0, V7.3, V8.6, V12.0, V7.3.2, V8.8, V12.1, V8.4, V7.0, V7.2, V9.0
Article ID: 000086252
Primary Subject: Reactors
Converted from "3781_Default.txt"

Applicable Version(s)

All

Problem Statement

What are the units for Power Law expression pre-exponential factor? Where is it documented?

Solution

The pre-exponential factor in the power-law rate expression has very complex units which depend on the concentration basis selected and whether a reference temperature is specified. The concentration is converted to SI units before the rate is calculated. The pre-exponential factor has the units needed to make the overall rate expression have SI rate units, that is kgmole/(sec-m^3) for a rate basis of reaction volume or kgmole/(sec-kg catalyst) for a basis of catalyst weight (version 2004.1 and higher). The reactor volume or catalyst weight used is determined by or specified in the reactor where the reaction is used.

This information is available from the on-line help, by choosing help while on the Pre-exponential factor field. It is also found by going to the Help Topics for Aspen Plus, and then navigating to Using Aspen Plus \ Specifying Reactions and Chemistry \ Specifying Power Law Reactions \ Rate-Controlled Reactions.

The units for the pre-exponential factor are as follows:

When [Ci] Basis is	Units are: (To is not specified)	Units are: (To is specified)
Molarity	$\frac{\frac{\text{kgmole}\ \text{-K}^{\text{-n}}}{\text{sec}-\text{m}^3}}{\left(\frac{\text{kgmole}}{\text{m}^3}\right)^{\Sigma a_i}}$	$\frac{\frac{\text{kgmole}}{\text{sec}-\text{m}^3}}{\left(\frac{\text{kgmole}}{\text{m}^3}\right)^{\Sigma a_i}}$
Molality	$\frac{\frac{\text{kgmole}\ \text{-K}^{\text{-n}}}{\text{sec}-\text{m}^3}}{\left(\frac{\text{gmole}}{\text{kg}\,\text{H}_2\text{O}}\right)^{\Sigma a_i}}$	$\frac{\frac{\text{kgmole}}{\text{sec}-\text{m}^3}}{\left(\frac{\text{gmole}}{\text{kg}\,\text{H}_2\text{O}}\right)^{\Sigma a_i}}$
Mole fraction or Mass fraction	$\frac{\text{kgmole}\ \text{-K}^{\text{-n}}}{\text{sec}-\text{m}^3}$	$\frac{\text{kgmole}}{\text{sec}-\text{m}^3}$
Partial pressure	$\frac{\frac{\text{kgmole}\ \text{-K}^{\text{-n}}}{\text{sec}-\text{m}^3}}{\left(\frac{\text{N}}{\text{m}^2}\right)^{\Sigma a_i}}$	$\frac{\frac{\text{kgmole}}{\text{sec}-\text{m}^3}}{\left(\frac{\text{N}}{\text{m}^2}\right)^{\Sigma a_i}}$
Mass concentration	$\frac{\frac{\text{kgmole}\ \text{-K}^{\text{-n}}}{\text{sec}-\text{m}^3}}{\left(\frac{\text{kg}}{\text{m}^3}\right)^{\Sigma a_i}}$	$\frac{\frac{\text{kgmole}}{\text{sec}-\text{m}^3}}{\left(\frac{\text{kg}}{\text{m}^3}\right)^{\Sigma a_i}}$

The kgmole/(sec-m^3) is replaced with kgmole/(sec-kg catalyst) in the table above if a basis of catalyst weight is used.

KeyWords

powerlaw
power-law units
of measure
preexponential