A First Course on Kinetics and Reaction Engineering Example 17.2

Problem Purpose

This problem presents an illustration of a real parallel reaction network.

Problem Statement

The chlorination of toluene using molecular chlorine produces *o*-chlorotoluene, traces of *m*-chlorotoluene and *p*-chlorotoluene. Write equations for the reactions that are involved and classify them.

Problem Solution

In this case, toluene can react with chlorine to produce one of three possible products. The chlorination reactions are given in equations (1) through (3).



This is a parallel reaction network. This parallel reaction network illustrates a second common occurrence, which leads to an interesting reaction engineering challenge. Specifically, *p*-chlorotoluene is more valuable than the other two products, and therefore it is desirable to design and operate the reactor so that the selectivity for *p*-chlorotoluene is as high as possible.