

Imagine you're running a chemical reaction in a PFR reactor. In this reactor, the rate at which the reaction happens (let's call it $-r_A$) depends on the concentration of one of the substances involved in the reaction (let's call it A). So, if you double the concentration of A , the reaction rate doesn't just double, it quadruples because you're squaring the concentration. Now, in this case, the rate at which A reacts is proportional to the square of its concentration.