

ABSTRACT

The effects of copper sulfate on the kinetics of the decomposition of hydrogen peroxide in a sulfuric acid solution were investigated. This was done by measuring the change in temperature as a function of time in a well stirred batch reactor (vacuum flask) immersed in a temperature controlled water bath. The cooling curve when no reaction was taking place was used to determine the heat loss from the reactor. The temperature that was measured during reaction was then corrected to account for heat losses and this corrected temperature profile corresponds to that which would be found in an effectively adiabatic reactor. The corrected temperature is related to the extent of reaction and thus by following the corrected (adiabatic) temperature profile one can monitor the extent as a function of time.

It was found that at lower temperatures (below 58°C) the rate of reaction was too slow to measure in the equipment. The reaction rate was sufficiently fast so as to allow accurate measurements of temperatures when the initial temperature was increased to 67°C. Unlike what had been expected there was not a single reaction but an exothermic reaction followed by an endothermic reaction. It was shown that both the adiabatic temperature rise and fall were proportional to the amount of hydrogen peroxide added.

The amount of copper sulfate present in the solution affected the exothermic part of the rate of the decomposition of peroxide. However, the amount of copper sulfate had no effect on the rate of the endothermic reaction. A simple model that had an asymptote was chosen to model the effect of the copper sulfate on the rate of the exothermic

reaction and it was shown to fit the results very well. A possible explanation for the exothermic reaction followed by the endothermic reaction was proposed.