Cohesiveness of the Oscillating B-Z Reaction

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The Oscillating BZ Reaction is a chemical reaction initially studied by Russian military officer Belousov. Although extensively studied, it is not completely understood why or how oscillating reactions occur. Numerous mechanisms have been proposed to reach the BZ reaction however the model known as the Oregonator provides a simplified mechanism to reach the oscillating state. While being constantly stirred, deionized water and sulfuric acid were combined in a beaker to which a conductivity probe was added. Malonic acid, potassium bromate, and manganese sulfate, respectively, were poured into the solution causing the oscillations to begin, switching from a clear solution to a pale pink color. The conductivity was measured every tenth of a second for three minutes, and trials were performed at four different temperatures. A Markovian Analysis was used to interpret 300 pieces of the data collected. The change in conductivity was measured in between each sample and the calculations were imputed into a square matrix. When the matrix was squared in each trial, there was found to be two transition states between the original and steady matrices; representing the intermediate reactions between the oscillations. The findings were unique because the transition matrices have never been analyzed using change in conductivity and Markovian sequencing. From the steady matrix at each temperature, the probability of “hopping” between different changes in conductivity can be determined in the long term analysis of the oscillations. These values can also be compared to determine if temperature has an effect on the cohesiveness of the oscillating B-Z reaction.

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