

Modeling Electrochemical Sterilization of Medical Devices by Chlorine Dioxide

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The sterilization of medical devices is one of the most critical steps in the operation of medical clinics and hospitals. This study investigated the effects of ClO₂ concentration, exposure time, temperature, and humidity on sterilization efficiency, along with modeling and optimization. The rate of ClO₂ generation and decay under different sterilization conditions was evaluated. A sterilization map was established as a function of ClO₂ concentration and exposure time being classified into three regions, such as sterilization, transition, and non-sterilization. Elevated temperature enhanced sterilization and its effect was incorporated into the rate constant. The ClO₂ generation/decay equations fit its gas phase concentration well when its production was discontinued, but not with continuous generation. Further studies on ClO₂ kinetics as well as the effect of electric current are needed.