Investigating the Feasibility of Chlorinated Resin for Water Disinfection in Developing Countries

T. Mtimuni*, P. Lingam

Department of Chemical Engineering, Stellenbosch University, Banghoek Road, Stellenbosch 7600, South Africa. Email: *25732153@sun.ac.za; Tel: +27 783302190

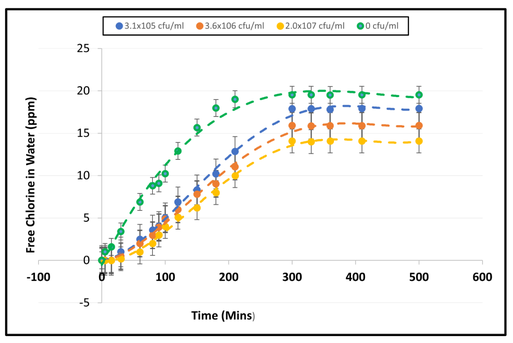
Introduction

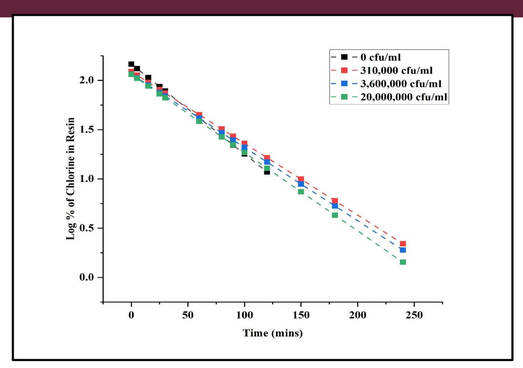
Chlorine, the most used disinfectant in water treatment, poses a challenge in determining the dosage, causing excessive chlorination, resulting in the formation of cancer-causing disinfection by-products. N-halamine polymers, which contain nitrogen-chlorine linkages that release halogens (ie. Chlorine) in a regulated and sustained manner, have gained attention.

Aims and Objectives

- Develop a chlorinated resin by functionalizing a Merrifield resin to use as a disinfectant and release chlorine in a slow and regulated manner.
- Assess the performance of the chlorinated resin in terms of chlorine release, disinfection efficacy,

Results: Chlorine Release Kinetics



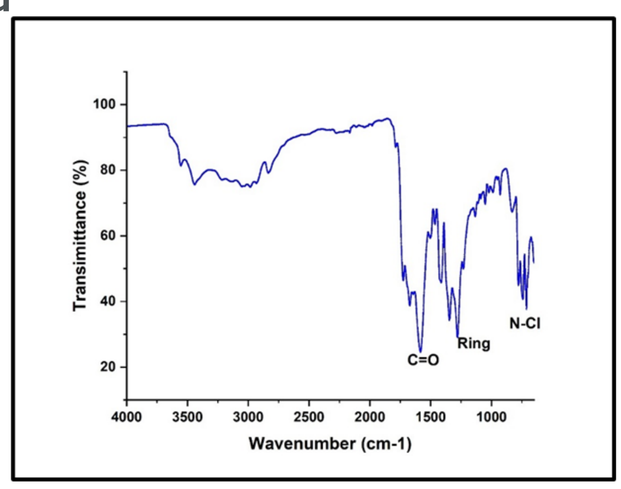


Feed Concentration has no effect on Chlorine Release Rate, Bacteria indirectly influence the fate of chlorine.

Results: Chlorinated Resin

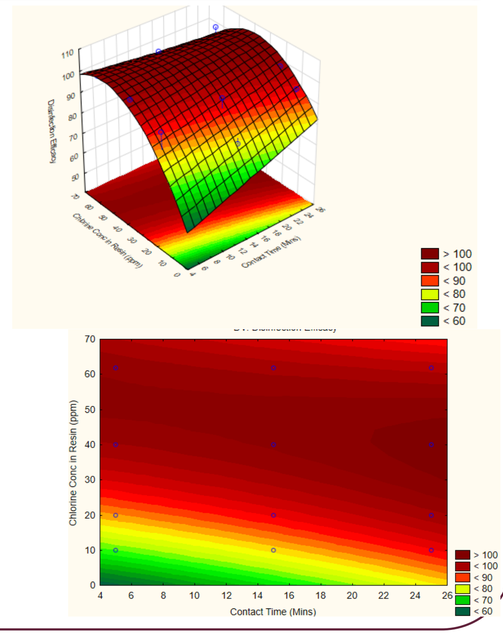
FTIR Of developed Chlorinated Resin had an N-Cl peak at 714 cm-1.

Iodometric Titration Results indicated a 6.18% Cl Loading in the optimum Resin

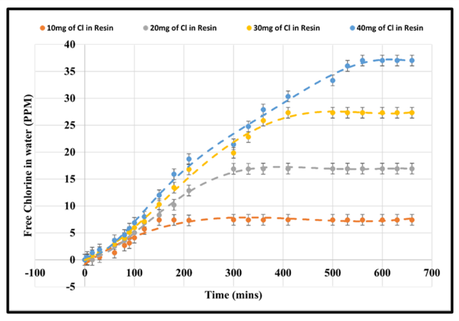


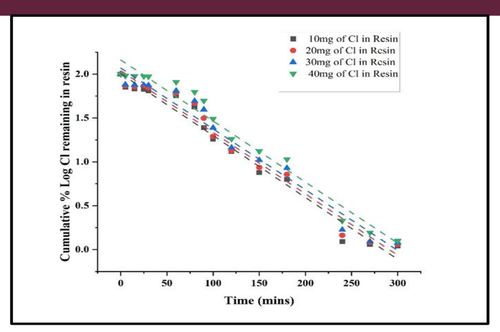
Results: Disinfection Efficacy

Both contact time and chlorine amount in resin had an effect on the disinfection efficacy, with a minimum of 30mg of chlorine in resin achieving 99.9% disinfection in 5 mins



Results: Kinetic Model of Chlorine Release





Comparing the k values from the kinetic model, Chlorine concentration had an effect on the release rate of chlorine from the resin with the rate increasing with an increase in concentration

Conclusion

- The study has demonstrated that the resin can be used as a POU device to release 0.23 ppm/min Cl, achieving maximum disinfection.
- The residual Cl can be adjusted for any amount of resin using the first-order kinetic model, K values

References:Chen, Y., Worley, S.D., Kim, J., Wei, C.-I., Chen, T.-Y., Santiago, J.I., Williams, J.F. & Sun, G. 2003. Biocidal Poly(styrenehydantoin) Beads for Disinfection of Water. DOI: 10.1021/ie020266.