A Computer Controlled Low Cost Indoor Airborne Formaldehyde Removing System by Electrolysis of Common Salt Water

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More than 10,000 people die of formaldehyde pollution of indoor air every year in China. However, existing commercial solutions to this problem have drawbacks, such as low efficiency and high costs. This project aims to identify a safe, inexpensive and highly efficient oxidant to remove airborne formaldehyde, and to integrate chemical, mechanical and electronic subsystems into a total engineering solution. The existing literature and initial experiments indicate that NaClO from saline electrolysis may be a good candidate as a formaldehyde oxidant. To verify this hypothesis experimentally with high repeatability and accuracy, standard formaldehyde gas and enrichment analysis were used. A series of experiments indicated that there was an optimum condition in which the electrolytic voltage, NaCl concentration and solution pH permitted the efficiency of formaldehyde removal to reach 70%, which is much higher than 16%-50% in most commercial systems. The experiments also show that NaCl can be fully regenerated and recycled, eliminating the cost and inconvenience of replacing consumable chemicals periodically in many commercial systems. An engineering prototype with a removal efficiency of 80% was designed and built so that the system could be used at home and in the workplace. A computer provides feedback control that enables the system to operate under optimum and safe conditions. Home networks and smart phone connections allow for additional remote control and data processing. This project proves that this simple saline-based system has great potential for providing a low-cost and highly efficient solution to fight indoors formaldehyde pollution. A further extension of this project is to make it open source in order to promote this technology in developing countries.

Awards Won:
Patent and Trademark Office Society: Award scholarship of $5,000