NEUTRALIZATION OF QUATS PRESENT IN WASTEWATER

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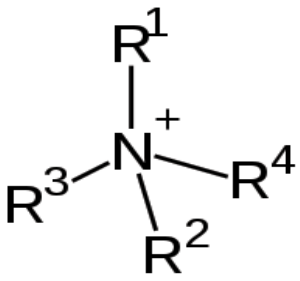
INTRODUCTION

Quaternary ammonium cations (QUATS) are well known for their sanitization and disinfectant properties and are widely used in industries. But, Quats are toxic to the wastewater biological treatment systems and also to the environment biological activity. Therefore the treatment of the QUATS is necessary.



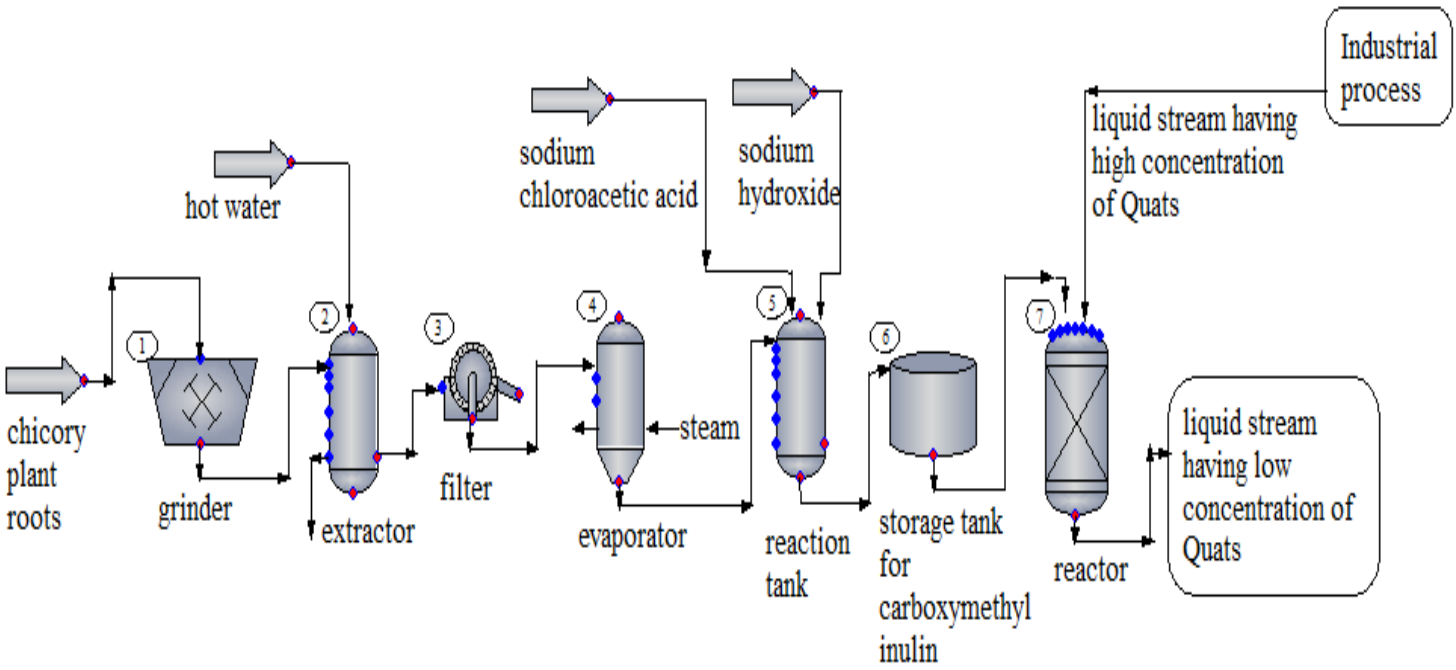
(QUATS)

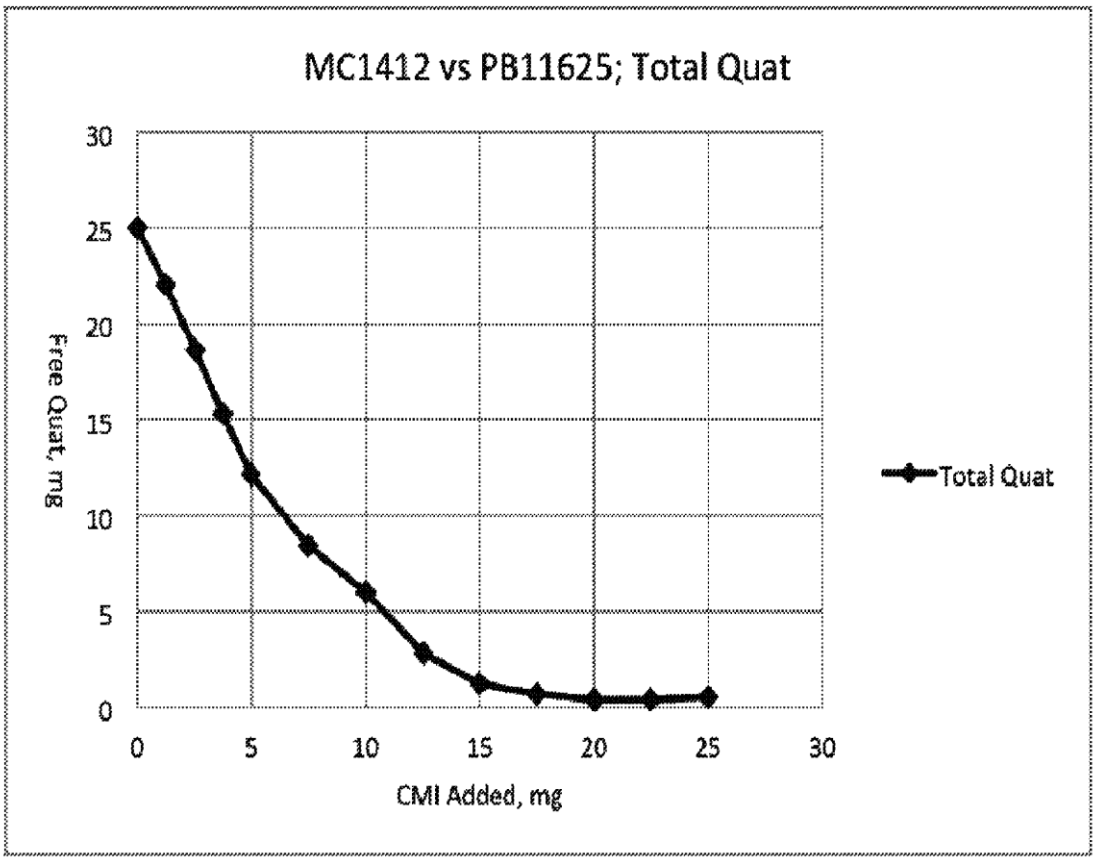
We have suggested 2 methods for the treatment of QUATS.

Method 1: *Reaction with carboxymethyl inulin for QUATS removal*

Certain biopolymers derived from chicory root extract, such as carboxymethyl inulin are effective in reducing the concentration, removing or sequestering Quats from a liquid stream. Carboxymethyl inulin is a biopolymer derived from natural β(2-1)polyfructosid with a glucose unit at the reducing end. Carboxymethyl inulin can be produced by first extracting inulin from a given plant, using water and then adding sodium chloroacetic acid and NaOH to the extracted inulin. Inulins are a group of naturally-occurring polysaccharides produced by many types of plant. CMI can be produced by first extracting inulin from a given plant, such as chicory root, using water and then adding sodium chloroacetic acid and sodium hydroxide to the extracted inulin. Carboxylate groups are introduced into the polysaccharide by carboxymethylation with sodium monochloroacetate as a reagent in an alkaline medium provided by the sodium hydroxide.

Flow diagram of *method 1*: -

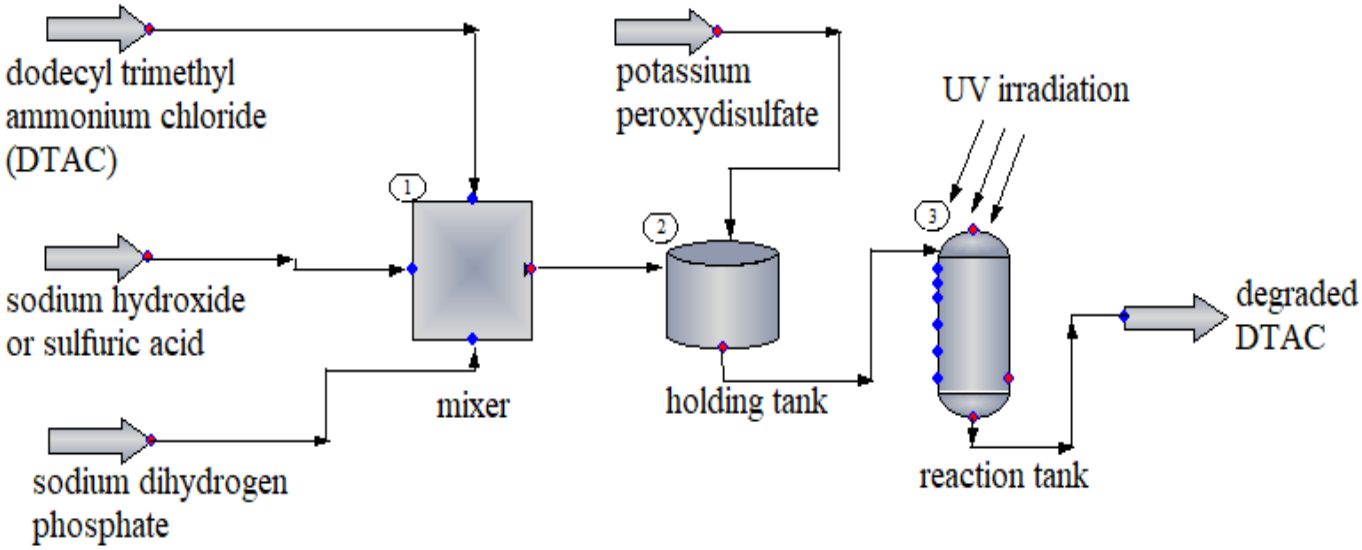


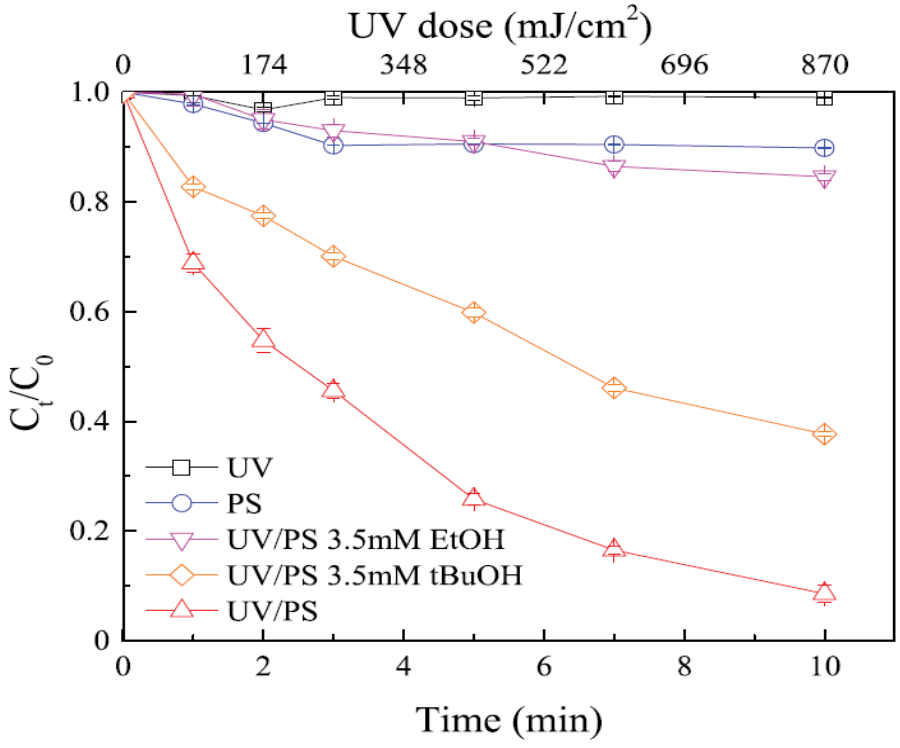


Method 2: UV/PS oxidation for degradation of Dodecyl trimethyl ammonium chloride (DTAC)

DTAC is a quaternary ammonium compound that is used industrially as sanitizer and surfactant. DTAC can be degraded by ultraviolet combined with persulfate (UV/PS) treatment. UV/PS treatment is an efficient advance oxidation process. H_2SO_4 or NaOH and NaH_2PO_4 are added in DTAC solution for maintaining pH and then potassium peroxydisulfate (PS) is added. This PS-spiked reaction solution is placed under UV irradiation. Due to combined effect of UV/PS oxidation DTAC is significantly degraded.

Flow diagram of *method 2:-*





INNOVATIVE IDEA AND ADVANTAGES

- In method 1 carboxymethyl inulin that is used to reduce the concentration of Quats is NOT TOXIC.
- In method 2 acute toxicity of DTAC solution can be completely detoxified by UV/PS oxidation.
- The neutralizing element used in method 2 is less toxic then Quats.
- In method 2 degradation of DTAC upto 91% can be achieved.

CONCLUSION

1. The addition of biopolymers like CMI reduces the effective concentration of QUATS.
2. The estimated toxicity of DTAC indicated that the UV/PS process can be competent method for decomposition of parent compound, TPs, and detoxification of DTAC. The UV/PS can efficiently degrade DTAC, following a pseudo first order kinetics.

KEYWORDS

Quats, Carboxymethyl inulin, UV/persulfate, advance oxidation process