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Cyanide-containing Wastewater Treatment with Ozone Fine Bubbles

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Abstract

Sodium cyanide and potassium cyanide are commonly used as a complex agent in electroplating bath, cyanide bearing waste water requires treatment due to the high toxicity. Generally, alkaline chlorination has been widely applied as an oxidative decomposition method since its introduction in the mid-1960s. Additionally, the chlorination as an oxidation treatment is relatively inexpensive and readily available, making it a cost-effective and convenient treatment method for small-scale electroplating facilities. However, after more than half a century since its development and implementation, attention has turned to more simple treatment method which is cheaper in terms of running costs and shorter reaction times compared to the alkali chlorination method. We have investigated decomposition for cyanide waste solutions using ozone fine bubbles (OFB) and found that this method is efficient way of decomposition of cyanide.

Keywords：Fine bubble, Cyan decomposition, Ozone, Wastewater treatment

1. Introduction

Toxic chemicals such as sodium cyanide and potassium cyanide are still used in electroplating baths. Their cyanide-containing waste solutions are typically treated using alkali chlorination methods. This approach has been widely adopted in electroplating facilities since the mid-1960s, allowing stable cyanide decomposition through precise control of oxidation-reduction potential. Moreover, chlorination is relatively inexpensive and readily available, making it a cost-effective and convenient treatment method for small-scale electroplating operations [1].

However, over half a century since its development and implementation, drawbacks of the alkali chlorination method have become apparent in today's era of stringent environmental regulations and improved occupational safety. Major issues include chlorine gas generation, high chemical costs, and process complexity. Consequently, methods with lower running costs, shorter reaction times, utilizing persulfates or radicals (SO_4- and OH) generated by UV radiation, or employing ozone treatment, have been under consideration [2-4].

Recently, research has focused on the combined use of ozone and fine bubbles, which enhances gas dissolution and promotes reactions, for various applications. Ozone is a potent oxidant capable of rapidly and effectively decomposing cyanide compounds, and fine bubble technology improves gas dissolution efficiency and increases reaction surface area, potentially enhancing treatment efficiency [5].

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