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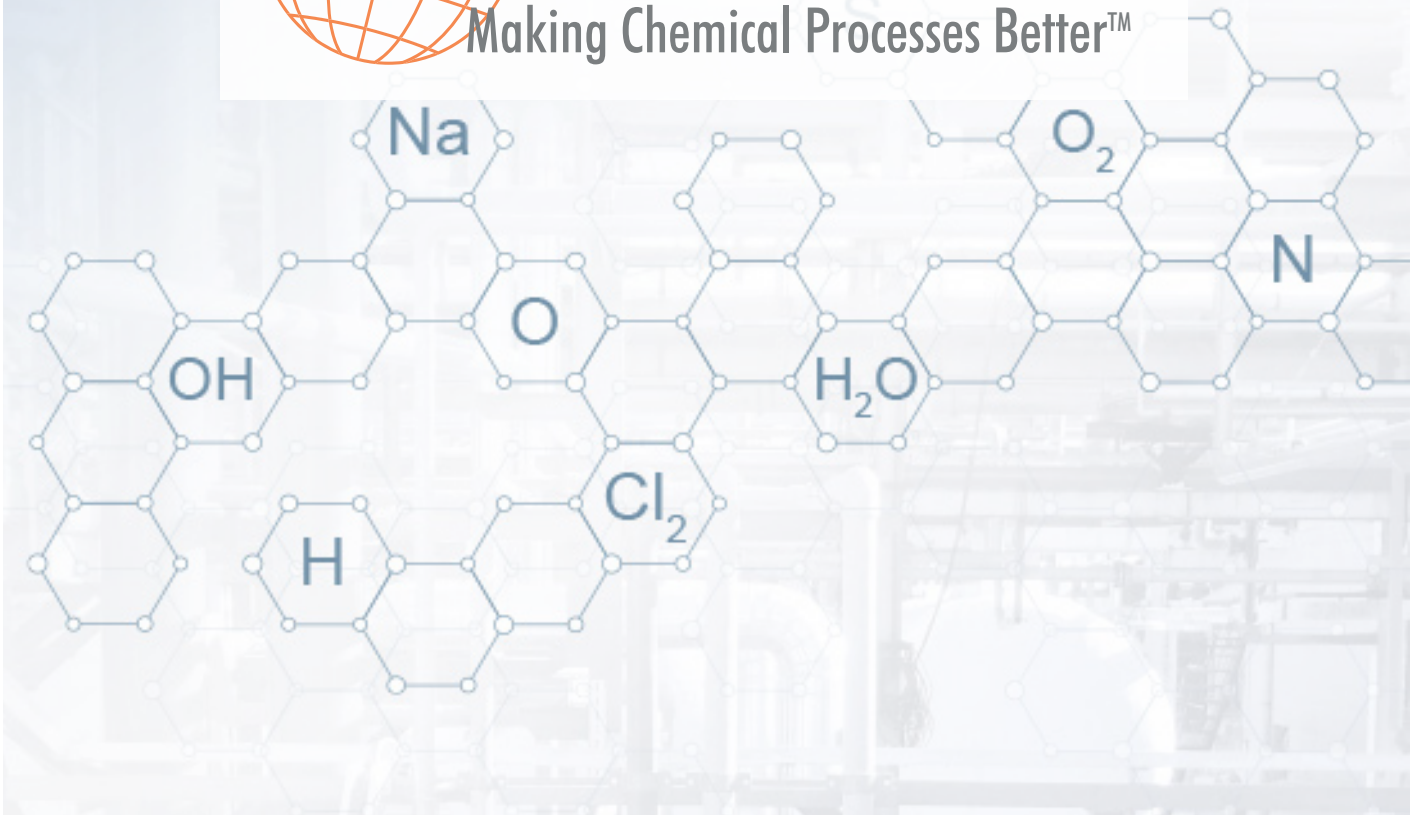

EFFECTIVENESS OF FILTERING LIQUID BLEACH

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The following is excerpted from *A Comparison of Methods for Determining the Concentration of Transition Metal Ions in Liquid Bleach*, a thesis by Hung A. Pham, Miami University, Oxford, OH 1997. This excerpt provides information that demonstrates the impact filtering can have on commercially available bleach. The bleach samples provided for this research were produced on equipment manufactured by Powell.

Abstract

The presence of transition metal (Cu, Fe, and Ni) ions in liquid bleach is a source of bleach decomposition that results in the build-up of oxygen. The oxygen build-up causes two problems for a water utility: it signifies that bleach is decomposing and more product must be used to disinfect the raw water; and the handling of the highly caustic solution becomes more dangerous due to a pressure build-up in storage containers and bleach transport piping.

Measurement of transition metal ions at low concentrations is a difficult task because liquid bleach contains a complicated matrix where the presence of transition metals can potentially be present as species with various ligands (e.g. $Ni(OCl)^+$, $Ni(OH)^+$, $NiCl^+$, etc.).

Methods to identify and routinely measure the transition metal ion species at concentrations below 1 mg/l in liquid bleach have not been developed. The purpose of this research was to explore, optimize and validate analytical methods that can be routinely used to measure transition metal ion concentrations in bleach.

Five methods (Visual Spot Test, Inductively Coupled Plasma, Chemometric Analysis, Chloroform Extraction Colorimetric and Ion Chromatography Postcolumn) have been evaluated in this study. The Ion Chromatography Postcolumn is the best method for determination of three transition metal ions because it has high precision, good accuracy and a low limit of detection (less than 10 µg/L).

Commercially Bleach Analysis

The presence of transition metal ions is known to catalyze the decomposition of bleach to form O^2. Build up of O^2 in storage tanks and pipes has become a safety issue for suppliers and water utilities. The presence of transition metal ions contributes to the loss of bleach strength. New specifications by water utilities to check transition metal ion concentrations in delivered bleach have been initiated. Therefore, suppliers and water utilities require simple and convenient transition metal ion analysis methods.

We felt it is necessary to test a number of commercially available bleach samples. This will define a typical transition metal (Cu, Fe and Ni) ion concentration range in bleach. We provided a number of bleach samples for analysis. Data from these representatives, commercially available bleach samples are presented below. Comparing Chloroform Extraction Colorimetric (CEC) and Ion Chromatography (IC) methods.

Supplier	Condition	CEC Method (µg/L)		IC Method (µg/L)		
		Cu	Ni	Cu	Fe	Ni
1	Unfiltered	47.8	326	55	948	387
	Filtered	15.5	<4.1	<9.8	186	<8.3
2	Unfiltered	42.5	432	40	1217	416
	Filtered	15.8	<4.1	<9.8	237	<8.3
3	Unfiltered	65.4	98.2	69	323	110
	Filtered	<4.4	<4.1	<9.8	92	<8.3
4	Unfiltered	<4.4	56.7	<9.8	234	47
	Filtered	<4.4	<4.1	<9.8	37	<8.3

This illustrates similar results for each transition metal ion in the bleach samples. The difference between the two is it ranges from 5.2 to 13.1% for Cu and from 3.7 to 13.2% for Ni. Analysis showed higher transition metal ion concentrations were found in unfiltered bleach samples.

Transition metal ion concentrations in unfiltered bleach were found for Cu (40 to 70 µg/L), Fe (230 to 1200 µg/L) and Ni (50 to 390 µg/L). For filtered bleach samples, Cu and Ni concentrations were greatly reduced by filtration and were below the limits of detection. Thus, we recommend that filtering your product for delivery to water utilities. Furthermore, water utilities should purchase filtered bleach to avoid the loss of bleach strength and the generation of O_2.

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