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TO L. B. Crider	FROM Avon Lake Technical Center	DATE THIS LETTER 12/17/73
SUBJECT W. J. Kroenke	FIELD POINT OR ADDRESS OF INTEREST Brecksville Research and Development	

Determining Exposure of Personnel to Gaseous Vinyl Chloride.

This note is a response to our conversation of December 13, 1973. It reports my opinions about the possibility of using inorganic or organometallic detector systems for either detecting or providing a cumulative measure of exposure to VCl. Ideally, such systems would be in the form of a badge, similar to the ones we now wear to detect exposure to x-rays. But with one additional feature. This is the ability to show, probably by means of a color change, immediately when a person has been exposed to some significant quantity of VCl.

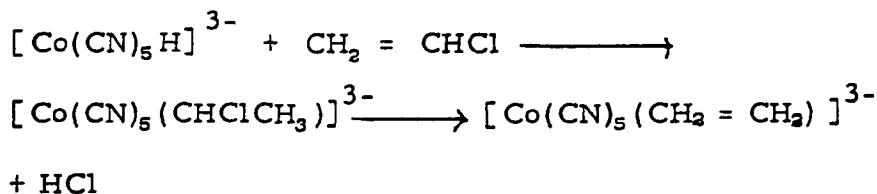
My conclusions and the discussion which follows are based on searching Chemical Abstracts up to July, 1972, and surveying the review literature pertaining to the formation of metal-vinyl compounds.

The scientific literature reports only a limited number of complexes or compounds formed between VCl and metal compounds which lead to the formation of stable metal-vinyl compounds. Of these only a few merit consideration in terms of the VCl detection problem, and they are discussed below:

(1) VCl-Organocyanocobaltate (III) Complexes

VCl reportedly reacts with an aqueous solution of $K_3[Co(CN)_5H]$ at room temperature.¹ The solution turns yellow with the formation of a 1/1 molar complex between VCl and the complex hydride. A yellow solid can be recovered from the solution.

Supposedly, the reaction proceeds as shown below:



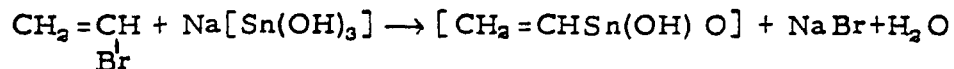
The $K_3[Co(CN)_5H]$ solution is made by bubbling H_2 through an aqueous solution of $K_3[Co(CN)_5]$.

(2) VCl- Stannite Ion Reaction

VBr is reported to react under alkaline conditions at 0°C with

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hydroxystannite ions.²



I do not know if the vinyl stannic acid is colored or if VCl would react the same way as VBr, but I would expect the same reaction.

(3) VCl - Hg (OAc)₂ Adducts

VCl reportedly forms a stable adduct with Hg(OAc)₂³. I do not know the details of this reaction, but the adduct can be isolated from a strongly ammoniacal mixture of alcohols using thin layer chromatography on silica gel.

I did find one other interesting report in the literature. It is in the form of a Russian Patent which claims that VCl reacts with aqueous Ni(OH)₂ to form acetaldehyde.⁴ Since aldehydes can generate colors by reacting with appropriate organic compounds, the VCl-Ni(OH)₂ reaction might provide the basis for a VCl detection system.

In summary, the chemical literature only reports a limited chemistry between VCl and either inorganic or organometallic compounds. Especially as applicable to the development of a VCl detection system. Although I have provided a few promising leads, they need additional researching in the literature and/or in the laboratory before their true potential would be apparent.

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cc: R&D Files (4016) ✓

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References

¹

J. Kwiatek and J. K. Seyler, J. Organometallic Chem., 3, 421-32 (1965).

²

A Solerio, Gazz. Chim. ital., 85, 61 (1955).

³

D. Braun and G. Vorendohre, Z. Anal. Chem., 199, 37-41 (1963).

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U.S.S.R. Patent, 107, 489, September 25, 1957.

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