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Analysis of Selected Decatur Employee Serum for Sulfonic and Carboxylic Fluorochemicals

This 3M technical report analyzed the 5 highest organic fluorine containing Decatur employee samples and analyzed the serum for perfluorooctanesulfonate, perfluorohexanesulfonate and perfluorooctanoate. In decreasing percent found, perfluorooctanesulfonate contributed between 55 - 80%, perfluorooctanoate contributed between 15 - 30% and perfluorohexanesulfonate contributed 5 - 15% of the organic fluorine. Analytical methods used were electron capture and microwave plasma detector.

3M TECHNICAL REPORT

Report Number: 7230

Date: October 4, 1979

TITLE: Analysis of Selected Decatur Employee Serum for Sulfonic
and Carboxylic Fluorochemicals

AUTHOR:

ABSTRACT:

The precence of C₆ and C₈ sulfonic acids was detected in certain blood samples using both electron capture and microwave plasma detector methods.

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CENTRAL ANALYTICAL LABORATORY

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Subject: Characterization of Decatur RF Values

Requestor: Dept. Name Commercial Chemicals Proj. No. 91721100

Request No. A73629 Dated October 3, 1979

Report:

The serum of 10 selected 3M Decatur employees was submitted (A72754) in June, 1979 for analysis of organic fluoride levels and the total organic fluoride values were reported in Analytical Report 7194. Subsequent to that work, it became of interest to further characterize the fluoride serum value and attempt to identify the presence of 3M fluorochemicals.

Initial analysis (7/18/79) by the microwave plasma detector (MPD) established the presence of the expected perfluorooctanesulfonate and perfluorooctanoate anions in the serum extract of -25 and -22. However, the observation of perfluorohexanesulfonate anion in the above extracts was unexpected and it therefore became necessary to spend additional analytical development time in order to measure these 3 fluorochemicals in the same serum extract sample. During this time, the method was evaluated on the electron capture (EC) gas chromatograph. The EC detector would be expected to have greater sensitivity than the MPD for these fluorochemicals but with less specificity since the MPD can be operated on the fluorine channel eliminating any confusion by other EC active compounds.

We selected the 5 highest fluorine containing Decatur samples and analyzed the serum extract for perfluorohexanesulfonate, perfluorooctanesulfonate, and perfluorooctanoate anion. We used both the MPD and EC detection systems and report the following values:

Person	RF (ppm) ^②	% FOUND ^①			
		Perfluorohexanesulfonate	Perfluorooctanesulfonate	Perfluorooctanoate	Total
-22	10.1	5%	60%	30%	95%
-23	5.7	15%	70%	20%	105%
-24	9.4	5%	80%	15%	100%
-25 ^③	11.8	5%	55%	20%	80%
-26	4.1	10%	65%	25%	100%

① The analysis was conducted on a single determination (1 ml of serum) due to limited availability of sample and time and represents our interpretation of the average of the EC and MPD values. No internal standard was used; expect ±10-20% accuracy.

② AR 6962, 7028, 7194

③ Previously identified as -21(Z) due to mis-labeling by medical personnel.

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The above results are necessarily somewhat approximate due to the lack of an internal standard and continual refinements in the derivatization and GC of the corresponding methyl ester. Sufficient sample remains for additional analysis. Further improvements in the analysis are and will continue to be made as time permits. We thought it best to report these values now, especially since we identified the presence of perfluorohexanesulfonate in human serum extract and no toxicology studies to date have been completed on this fluorochemical.

Three years ago (10-18-76) we reported that Decatur employee . serum extract contained perfluorooctanesulfonate (based on F/MR) and a minor fluorine containing component now identified as perfluorooctanoate. Therefore, the presence of perfluorooctanesulfonate in this individual has been known for some time. Now, with improved analytical methods, we have greater sensitivity and can determine the presence of perfluorohexanesulfonate in addition to perfluorooctanesulfonate anion.
