

FLUOROMETRIC FACTS

Bulletin No. 104

Fluorescent Tracer Dyes

Rhodamine WT has been approved as a tracer dye in potable water in the United States (1).

Rhodamine WT is related to rhodamine B, a tracer in common use in the 1960s. It was developed to overcome a disadvantage of rhodamine B, absorption on suspended sediment. The same modification was expected to reduce toxicity, and limited testing bore this out.

Rhodamine WT was an immediate success as a tracer in marine systems and in wastewater. While it was also used in potable water, such use was occasionally forbidden on the grounds that it did not have formal Federal approval for such use. Rhodamine WT is now approved for such use. A brief history follows.

While the EPA has sole responsibility for identifying those substances which may be used as tracers (2), the Food and Drug Administration (FDA) does issue policy statements. The FDA did issue such a policy statement on 22 April 1966 concerning rhodamine B (3). A temporary tolerance limit for ingestion of rhodamine B was set at 0.75 mg per day. Based on normally expensed water consumption, the tolerance would not be exceeded unless the concentration approaches 370 parts per billion (PPB). Noting that 30 PPB may be detected visually in a glass of water, and 10 PPB is visible in larger volume such as a clear reservoir, the FDA pointed out that if the dye is not visible, the tolerance would not be exceeded. The USGS, a large user of fluorescent dye tracers, directed that the concentration should not exceed 10 PPB at the intake of a water supply (4). The visual and instrumental detectability of rhodamine WT, based on active ingredient, is about the same as rhodamine B (rhodamine WT is supplied as a 20% aqueous solution).

Ten parts per billion may not sound like much to the uninitiated, but it is a thousand times the limit of detectability guaranteed by Turner Designs on its Model 10 Series Fluorometers (5). Background fluorescence caused by fluorescent materials in the water being studied usually limits detectability. But even so, measurements can be made to 0.1 part per billion of rhodamine WT (active ingredient), in raw sewage!

On April 10, 1980, Dr. Joseph A. Cotruvo of the U.S. EPA issued a memo stating that the EPA considers rhodamine WT to be equivalent to rhodamine B (1). More recently, the following policy letter was sent to Crompton and Knowles:

United States Environmental Protection Agency
Washington, D.C. 20460
Aug 2 1988

Office of Water

Ms. Janice Warnquist
Chemical Safety Manager
Crompton and Knowles Corporation
P.O. Box 341 (500 Pear Street)
Reading, Pennsylvania 19603

Dear Ms. Warnquist:

The Criteria and Standards Division (Office of Drinking Water) has reviewed the available data on chemistry and toxicity of Rhodamine dyes. We would not anticipate any adverse health effects resulting from the use of Rhodamine WT as a fluorescent tracer in water flow studies when used with the following guidelines.

- A maximum concentration of 100 micrograms/liter Rhodamine WT is recommended for addition to raw water in hydrological studies involving surface and ground waters.
- Dye concentration should be limited to 10 micrograms/liter in raw water when used as a tracer in or around drinking water intakes.
- Concentration in drinking water should not exceed 0.1 micrograms/liter. Studies which result in actual human exposure to the dye via drinking water must be brief and infrequent. This level is not acceptable for chronic human exposure.

- In all of the above cases, the actual concentration used should not exceed the amount required for reasonably certain detection of the dye as required to accomplish the intended purpose of the study.

The Criteria and Standards Division recommends that Rhodamine B not be used as a tracer dye in water flow studies.

This advisory supersedes all earlier advisories issued by EPA on the use of fluorescent dyes as tracers in water flow studies. This advisory is granted on a temporary basis only.

EPA is terminating its voluntary additives advisory program as announced in the Federal Register (53 FR, 25586, July 7, 1988). A copy of the Federal Register Notice is enclosed for your convenience. All EPA advisory opinions issued within the framework of the additives program will expire on April 7, 1990.

Our opinion concerning the safety of this tracer dye does not constitute an endorsement, nor does it relate to its effectiveness for the intended use. If this letter is to be used in any way, we require it to be quoted in its entirety.

Sincerely,

Arthur H. Perler, Chief
Science and Technology Branch
Criteria and Standards Division

Enclosure

REFERENCES

1. Cotruvo, J. A., RHODAMINE WT AND B, Memo to P. J. Traina, dated April 10, 1980
2. Letter from A. D. Laumbach, FDA, to George Turner, dated 7 June 1977
3. POLICY STATEMENT ON USE OF RHODAMINE B DYE AS A TRACER IN WATER FLOW STUDIES, Department of Health, Education and Welfare, dated 22 April 1966
4. Kilpatrick, F. A., DOSAGE REQUIREMENTS FOR SLUG INJECTIONS OF RHODAMINE BA AND WT DYES, U. S. Geological Survey, Prof. Pater 700-B, B250-253 (1970)
5. FIELD FLUOROMETRY, Monograph available at no charge from Turner Designs

