

9/15/1992

DATA EVALUATION RECORD

- 1. **CHEMICAL:** Silver-Copper Zeolite; Shaughnessey No. 129057
- 2. **TEST MATERIAL:** Silver-Copper Zeolite; 4 ±1% silver and 6 ±1% copper; a blue-green powder.
- 3. **STUDY TYPE:** Freshwater Fish Acute Toxicity Test. Species Tested: Rainbow Trout (Oncorhynchus mykiss).
- 4. **CITATION:** Ward, T.J. and R.L. Boeri. 1990. Acute Flow-Through Toxicity of Silver-Copper Zeolite to the Rainbow Trout, Oncorhynchus mykiss. EnviroSystems Study No. 89101-ADL. Prepared by EnviroSystems Division, Resource Analysts, Inc., Hampton, NH. Submitted by Kanebo Zeolite USA, Inc. EPA MRID No. 416158-14.

5. **REVIEWED BY:**

Heather N. Mansfield, Zoologist  
Ecological Effects Branch  
Environmental Fate and Effects Division

Signature: *Heather Mansfield*  
Date: *9/2/92*

6. **APPROVED BY:**

Allen Vaughan, Acting Head, Section 2  
Ecological effects Branch  
Environmental Fate and Effects Division

Signature: *Allen W. Vaughan*  
Date: *9.15.92*

- 7. **CONCLUSIONS:** This study is scientifically sound but may not be used for assessing the environmental impact of silver-copper zeolite largely because silver and copper levels could not always be detected. The 96-hour LC<sub>50</sub> was 100 mg/L, based on nominal concentration. The NOEC was estimated to be 50 mg/L (nominal). The LC value classifies this material as slightly toxic to rainbow trout.
- 8. **RECOMMENDATIONS:** This study should be repeated to more accurately assess the actual concentration of the metals present in the solution.
- 9. **BACKGROUND:**
- 10. **DISCUSSION OF INDIVIDUAL TESTS:** N/A.

**11. MATERIALS AND METHODS:**

A. **Test Animals:** Juvenile rainbow trout (Oncorhynchus mykiss) were obtained from a commercial supplier in Hampton, NH. The fish were acclimated to the facility for 45 days. They were held in flowing well water with a temperature of 11.7-13.2°C and a dissolved oxygen (D.O.) of 9.0 mg/L, during the 14 days prior to test initiation. The fish were fed a commercially available fish food once or twice daily except for 96 hours immediately prior to the test and during the testing. The fish were free from disease, injuries, and abnormalities at the beginning of the test. The average length and weight of the control fish at the end of the experiment were 41.1 mm (range = 37.7 to 43.2 mm) and 0.66 g, respectively.

B. **Test System:** An intermittent-flow proportional diluter delivered test solution or control water to individual 20-L glass aquaria (20-cm wide by 40-cm long by 25-cm deep) containing 15 L of test solution or control water (water depth of approximately 19 cm). All parts of the diluter in contact with the test solutions were made of glass or Teflon. The volume of each aquarium was replaced an average of 7.0 times every 24 hours. The test aquaria were randomly positioned in a temperature-controlled water bath set at 12 ±1°C. The system was maintained on a 16-hour light/8-hour dark photoperiod under cool-white fluorescent light with an intensity of 10  $\mu\text{Es m}^{-2}$ .

The test dilution water was well water collected in Hampton, NH. Water was adjusted to a hardness of 40-48 mg/L as  $\text{CaCO}_3$  and stored in polyethylene tanks where it was aerated. Results of chemical analysis are presented in Table 1 (attached).

A 50,000 mg/L stock was prepared in deionized water and appropriate amounts of this stock were added directly to dilution water by a proportional diluter and mixed before delivery.

C. **Dosage:** Ninety-six-hour, flow-through, acute toxicity test. Five nominal concentrations (7, 13, 25, 50, and 100 mg/L), and a dilution water control were used. Because of the large amount of solids present in the mixtures, 100 mg/L was determined to be the highest possible test concentration that could be delivered by the diluter. The concentrations made were based on the total weight of the test material.

- D. **Design:** Twenty rainbow trout were indiscriminately distributed among two replicates for each treatment. The loading during the test was approximately 0.44 g/L. The test containers were not aerated.

Observations of mortality and sublethal responses (loss of equilibrium, erratic swimming, loss of reflex, excitability, discoloration, or change in behavior) were recorded every 24 hours. Dead fish were removed from the containers when observed. The temperature, dissolved oxygen, conductivity, and pH were measured daily in each aquarium containing live fish. The temperature in one aquarium was recorded continuously during the study.

Silver-copper zeolite concentrations were measured using ICP and AA on samples pooled from each replicate of each test concentration. The samples were collected at 0 and 96 hours.

- E. **Statistics:** Median lethal concentrations ( $LC_{50}$ ) were calculated by the binomial, moving average, or probit method using nominal concentrations of test material or measured concentrations of silver and copper (both total and dissolved). The no-observed-effect concentration (NOEC) was the test concentration that allowed at least 90% survival of exposed test organisms.

12. **REPORTED RESULTS:** Conductivity ranged between 1000 and 1100  $\mu\text{mho/cm}$ . The pH ranged between 7.7 and 8.1. Temperatures ranged between 11.1 and 12.3°C. Dissolved oxygen ranged from 10.2 to 11.2 mg/L (94-104% of saturation).

All test vessels containing silver-copper zeolite were turbid and contained settled particulates. Measured concentrations of total silver and total copper generally agreed with nominal concentrations (Table 2, attached). Measured dissolved silver and copper concentrations were generally slightly higher or at the limit of detection of 0.005 mg/L.

One hundred percent survival was observed in the control exposure. The  $LC_{50}$  values calculated with silver-copper zeolite and each individual metal are presented in Table 4 (attached). The LC values could not be calculated with measured concentrations of dissolved silver because of the imprecision of the analytical data that resulted from the proximity of the measured values to the analytical detection limit. The 96-hour  $LC_{50}$  was 100 mg/L with 95% confidence

limits of 50->100 mg/L, based on nominal concentration of total product. The 96 hour NOEC was 50 mg/L based on nominal concentration of total product.

13. **STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES:**

The authors presented no conclusions except those previously noted.

Quality Assurance and Good Laboratory Practice Compliance statements were included in the report, indicating that the study was conducted in accordance with FIFRA Good Laboratory Practice Standards set forth in 40 CFR Part 160.

14. **REVIEWER'S DISCUSSION AND INTERPRETATION OF STUDY RESULTS:**

- A. **Test Procedure:** The test procedures were generally in accordance with protocols recommended by the guidelines, but deviated from the SEP as follows:

The test material was not identified by a lot or batch number.

Two replicate test vessels were used per concentration. However, it was not stated whether the two replicates were in the same aquarium or separate (i.e., two aquaria).

A 30-minute dawn and dusk simulation is desired. Transition periods were not used in the study.

The nominal rates of test material were between 50-54% of the next highest rate. The guidelines recommend that the rates be 60% of the next highest rate.

Alkalinity was not measured.

Sublethal effects were not described.

- B. **Statistical Analysis:** The reviewer used a computer program to analyze the data and calculate the LC<sub>50</sub> value based on nominal concentration of total product. The results were the same as the authors' (see attached printout).

- C. **Discussion/Results:** The results of the analysis for silver-copper zeolite in the test solutions indicate that the concentration of dissolved silver and copper were much less than desired. Silver was often not detected. This may be due to the inherently low

solubility properties of these metals or to inadequate detection methods.

**D. Adequacy of the Study:**

- (1) **Classification:** Supplemental.
- (2) **Rationale:** Inadequate measuring of the concentrations of silver and copper.
- (3) **Repairability:** No.

**15. COMPLETION OF ONE-LINER FOR STUDY: Yes, 6-12-91.**

Silver Zestite OER

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The material not included contains the following type of information:

- Identity of product inert ingredients.
- Identity of product inert impurities.
- Description of the product manufacturing process.
- Description of quality control procedures.
- Identity of the source of product ingredients.
- Sales or other commercial/financial information.
- A draft product label.
- The product confidential statement of formula.
- Information about a pending registration action.
- FIFRA registration data.
- The document is a duplicate of page(s) \_\_\_\_\_.
- The document is not responsive to the request.

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The information not included is generally considered confidential by product registrants. If you have any questions, please contact the individual who prepared the response to your request.

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MOSSLER SILVER-COPPER ZEOLITE TROUT 6-12-91

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CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB. (PERCENT)
100	20	10	50	58.80985
50	20	0	0	9.536742E-05
25	20	0	0	9.536742E-05
13	20	0	0	9.536742E-05
7	20	0	0	9.536742E-05

THE BINOMIAL TEST SHOWS THAT 0 AND +INFINITY CAN BE USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS, BECAUSE THE ACTUAL CONFIDENCE LEVEL ASSOCIATED WITH THESE LIMITS IS GREATER THAN 95 PERCENT.

AN APPROXIMATE L<sub>50</sub> FOR THIS SET OF DATA IS 99.99999

WHEN THERE ARE LESS THAN TWO CONCENTRATIONS AT WHICH THE PERCENT DEAD IS BETWEEN 0 AND 100, NEITHER THE MOVING AVERAGE NOR THE PROBIT METHOD CAN GIVE ANY STATISTICALLY SOUND RESULTS.

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