

9/15/1992

MRID No. 416158-15

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 Invertebrate Acute Toxicity Test. Species Tested: Daphnia magna.
- 4. **CITATION:** Ward, T.J. and R.L. Boeri. 1990. Acute Flow-Through Toxicity of Silver-Copper Zeolite to the Daphnid, Daphnia magna. EnviroSystems Study No. 89102-ADL. Prepared by EnviroSystems Division, Resource Analysts, Inc., Hampton, NH. Submitted by Kanebo Zeolite USA, Inc. EPA MRID No. 416158-15.

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 the concentration of silver was often not detected. The detected concentration of both silver and copper were far below the nominal concentrations. The 96-hour EC₅₀ value was 0.60 mg/L, based on nominal concentration. The NOEC was estimated to 0.25 mg/L (nominal). The EC₅₀ value classifies this material as highly toxic to daphnids.
- 8. **RECOMMENDATIONS:** This study should be repeated to more accurately assess the actual concentration of the metals present in the test solutions.

9. **BACKGROUND:**

10. **DISCUSSION OF INDIVIDUAL TESTS:** N/A.

11. **MATERIALS AND METHODS:**

- A. **Test Animals:** Daphnia magna (less than 24 hours old) were reared in-house. The daphnids were free from disease, injuries, and abnormalities at the beginning of the test. The average wet weight of the control daphnids at the end of the experiment was 0.007 g.
- 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 15.5 times every 24 hours. The daphnids were housed in cages suspended in the test aquaria which were randomly positioned in a temperature-controlled water bath set at $20 \pm 1^\circ\text{C}$. The system was maintained on a 16-hour light/8-hour dark photoperiod under cool-white fluorescent light with an intensity of $80 \mu\text{Es}^{-1}\text{m}^{-2}$.

The test dilution water was well water collected in Hampton, NH. Water was adjusted to a hardness of 40-48 mg as CaCO_3 and stored in polyethylene tanks where it was aerated. Results of chemical analysis are presented in Table 1 (attached).

A 2,500 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:** Forty-eight-hour, flow-through, acute toxicity test. Based on a preliminary test, five nominal concentrations (0.07, 0.13, 0.25, 0.50, and 1.0 mg/L), and a dilution water control were used. The concentrations made were based on the total weight of the test material.
- D. **Design:** Twenty daphnids were indiscriminately distributed among two replicates of each treatment. The loading during the test was approximately 0.005 g/L. The test containers were not aerated.

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

Silver-Copper Zeolite concentrations were measured using ICP and AA on pooled samples from each test concentration. Samples were collected at 0 and 48 hours.

- E. **Statistics:** Median lethal concentrations (LC_{50}) were calculated by the binomial method using nominal concentrations of test material. 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 1200 and 1400 $\mu\text{mho/cm}$. The pH ranged between 7.5 and 8.0. Temperatures ranged between 20.3 and 20.9°C. Dissolved oxygen ranged from 8.8 to 9.2 mg/L (96-100% of saturation).

Insoluble test material was not observed in test vessels containing Silver-Copper Zeolite. Measured concentrations of total copper generally agreed with nominal concentrations (Table 2, attached), but all other measured concentrations were not in agreement with nominal values. Measured silver and copper were generally slightly above or at the limit of detection of 0.005 mg/L.

One hundred percent survival was observed in the control exposure. The LC_{50} and EC_{50} values calculated with nominal values of silver-copper zeolite are presented in Table 4 (attached). The values could not be calculated with measured concentrations of total or dissolved silver or copper because of the imprecision of the analytical data that resulted from the proximity of the measured values to the analytical detection limit. The 48-hour LC_{50} and EC_{50} was 0.60 mg/L with 95% confidence limits of 0.50-1.0 mg/L, based on nominal concentration of total product. The 48-hour NOEC was 0.25 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 lot or batch number.

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

The number of solution volume replacements per day used during the test (15.5) was much greater than recommended (5-10).

An acclimation period and the culture conditions were not described in the report.

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

The amount of time between test solution preparation and daphnid addition was not stated.

Alkalinity was not measured.

Sublethal effects were not described.

- B. **Statistical Analysis:** The reviewer used computer programs to analyze the data and calculate the EC₅₀ value based on nominal concentration of total product. The results were the same as the authors'.
- C. **Discussion/Results:** The authors stated that two replications of each concentration were conducted. Because the cages were inside of one aquarium, these duplications were not true replicates.

The results of the analysis for silver-copper zeolite in the test solutions indicate that the concentrations of dissolved silver and copper were much less than desired. Silver was often not detected. This may either be due to the inherently low solubility properties of these metals or to inaccurate measuring techniques.

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, 6-13-91.

Silver Ledit 050

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Pages 6 through 8 are not included in this copy.

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.
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- FIFRA registration data.
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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.

MOSSLER SILVER-COPPER ZEOLITE DAPHNIA 6-12-91

CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB. (PERCENT)
1	20	20	100	9.536742E-05
.5	20	5	25	2.069473
.25	20	0	0	9.536742E-05
.13	20	0	0	9.536742E-05
.07	20	0	0	9.536742E-05

THE BINOMIAL TEST SHOWS THAT .5 AND 1 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 LC50 FOR THIS SET OF DATA IS .6024914

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.
