tions for copper and sodium (*3–5*) show that this situation would be favored in an open lattice, such as the diamond structure in which silicon crystallizes.

Our results thus lend further support to the idea that lattice disorder produced by neutron bombardment results in carrier traps in silicon which can be healed out by suitable heat treatment. It also confirms the division of the total atomic heat into two parts, as indicated by Eq. (3), and the identification of the linear term with the contribution of the carriers.

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Note added in proof: Another more homogeneous B.T.L. Si sample (Si V) has been investigated, and the results obtained agree with the results given above: $\theta_{orig} = 658°$ K, $\theta_{bomb} = 636°$ K; $\gamma_{orig} = 34.6 \times 10^{-6}$, $\gamma_{bomb} = 9.26 \times 10^{-6}$. Heat treatment again restores the electronic specific heat.

Insecticidal Effect of Inert Solid Diluents

T. C. Helvey

New York State University Teachers College, Oneonta

It has been known for many years that the inert diluents in insecticide dust mixtures have an influence on the toxicity of these mixtures. Many attempts have been made to determine the governing factors of this phenomenon (*1–3*). The answer is not only of scientific interest, but it is of great importance for insecticide manufacturers too, because it will help to select the most effective diluents.

The killing effect of the inert diluents is more likely to be related to the physical than to the chemical properties of the material.

The first step in this investigation was to locate the diluent particles when dusted onto the insect. It was thought that the smallest particles would enter the body of the insect through the mouth or spiracles and might cause fatal injuries to internal organs or interfere with their function (*4*). The second well-founded alternative, as advocated by Wigglesworth (*5*), claimed that the killing effect was due to an abrasive action on the exocuticle, with subsequent dehydration of the insect.

The diluent was coated with a fluorescent compound, Aesculin, for easier tracing of the small particles.

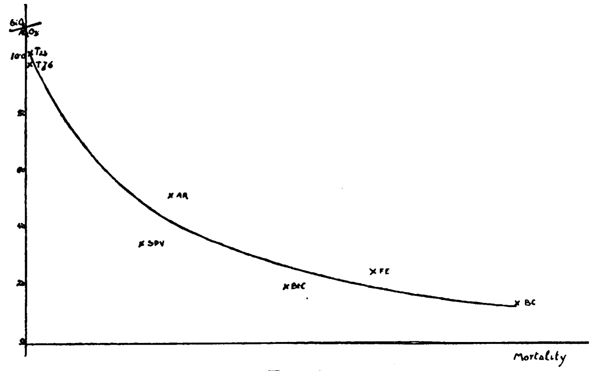

FIG. 1.

After the death of the insects they were examined externally and internally with the ultraviolet microscope, but no evidence could be found for the diluent particles having entered the body of the insects.

It was observed that the death of the larvae treated with coated silicates was retarded somewhat, as compared with insects treated with the same, but not coated diluent. This shows the harmlessness of the fluorescent compound, but no proper explanation could be given for the prolonged survival of the larvae. An agglomeration of smaller, microscopic particles as a result of the coating process is possible, since the diluent treated with distilled water gave similar delaying effect.

It was considered that the shape of the diluent particles or their crystal structure might bear a relation to the mortality of the larvae. Therefore the experiments were extended in this direction. Mexican bean beetle larvae were again used, since the effect of various diluents on the same insect had been already in-

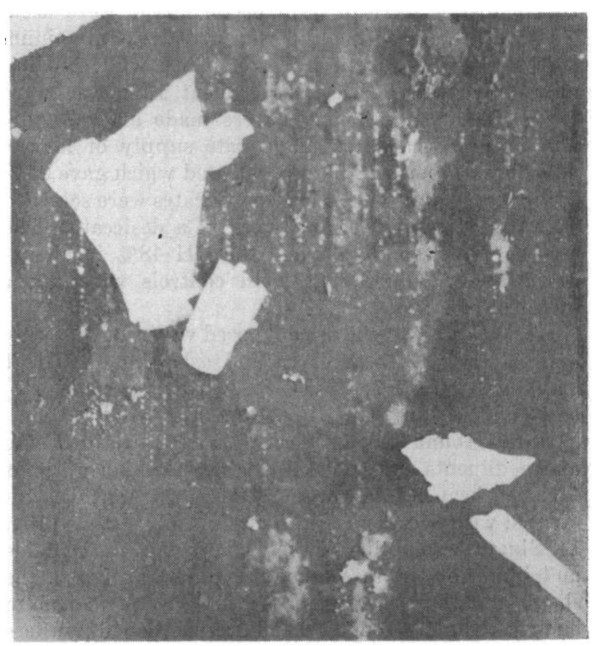

FIG. 2. EMTCO 23 T (T 23). No mortality.

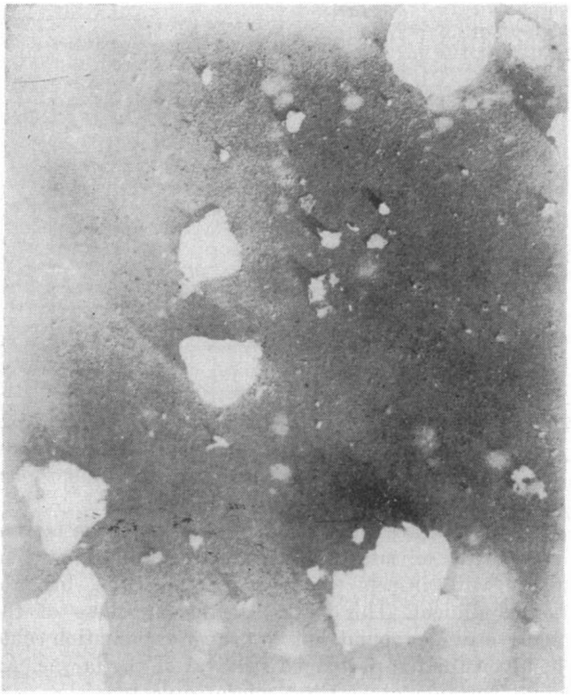

FIG. 3. Fuller's earth (FE). High mortality.

vestigated (*6*). The repetition of these experiments, however, gave in some instances significantly different results from those already published—this in spite of identical materials and conditions. Nevertheless, the trend of the effect of the different diluents was quite distinct, and the results could be used for a first approach.

For further experiments, about 24-hr-old third and fourth instar Mexican bean beetle larvae were used. They were exposed qualitatively to various aluminum silicate dusts and kept in a Petri dish while feeding on bean leaves. In each experiment 10 larvae were used, and mortality counts were made after 24, 48, and 72 hr. Because of inadequate supply of larvae, only those experiments were repeated which gave 25% or higher mortality in 24 hr. The silicates were screened with a 200-mesh sieve and dried in a desiccator. The temperature was 75° F, and the RH 48% in all experiments. Adequate untreated controls were under identical conditions.

Most effective of the diluents used were: Barden clay and Attaclay, fuller's earth and asbestine, Bancroft clay; least effective, EMTCO 23 Talc, Filtrol X-415, and Talc No. 6-J.

It was found that if the $SiO_2 : Al_2O_3$ ratio of the above diluents was plotted against the mortality of Mexican bean beetles, in many cases the mortality increased with decreasing ratio of the $SiO_2 : Al_2O_3$ (Fig. 1). Since the solubility of these compounds in the fluids and lipids of the insect body is quite negligible, the shape and the structure of the microcrystals had to be investigated. From all the above-mentioned powders x-ray diffraction pictures were taken, and the resulting Debye-diagrams recorded and evaluated by using a microphotometer, but no coherent or convincing explanation of above phenomenon could be achieved by this method.

The pictures of the inert diluents, taken with the electron microscope, have resulted in some information, yet it is contrary to expectation. Those diluents with little or no insecticidal effect show sharp edges and points (Fig. 2), whereas the highly effective members of above series appeared much less "abrasive" (Fig. 3). This could indicate that the dusts probably absorb, more than abrade, the waxy layer of the exocuticle or that the combined action is responsible for the effect of inert diluents on insects.

It is obvious that more research has to be done to elucidate these interesting problems of insect physiology. The use of different kinds of insects and other methods and materials may bring forward the answer. Such experiments are in progress and will be reported when completed.

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Uranium in the Clay of a Black Radioactive Shale

James H. Brown, Jr., and W. D. Keller
Department of Geology, University of Missouri, Columbia

The location of uranium in black shales is not well understood, and various reports suggest different loci for the element. McKelvey and Nelson (*1*) summarize the possibilities well as follows: "In fact, it is possible that no distinct uranium-bearing mineral is present in many of the shales, for the uranium may be in an organic compound or the uranium ion may be held by ion exchange, or by adsorption on organic matter or clay minerals, or as impurities in the crystal lattice of common minerals." The results of a brief study of a black radioactive shale from Ste. Genevieve Co., Mo., show that the uranium contained in it is located predominantly in a relatively fixed condition in the fine clay fraction, and not in the black organic matter.

This result is at variance with the suggestion (*1*, p. 40) "that the uranium in the black shales is more likely attached to organic matter than to clay" and does not support Frederickson's suggestions (*2*) that the UO_2^{++} ion may be "adsorbed between the graphite layers of carbonaceous material, forming a strong structure due to the stable UO_2^{++} holding the two layers together." On the other hand, simply because the uranium was not in closest association with the organic matter in