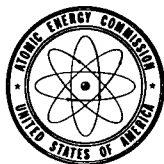


December 1968



# AEC-NASA TECH BRIEF



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## Hydrogen Peroxide Etching Proves Useful for Germanium

The influence of process variations in the etching of germanium with hydrogen peroxide has been studied, along with damage effects due to radiation. The work advances the knowledge of the etching process for germanium and provides information on the influence of pH, radiation, and pre-etching conditions.

Etching with 3 percent hydrogen peroxide is useful for removing fractional micron layers of germanium. Previous experimenters have used the technique to remove thin layers for determining ranges in ion bombardment. In the present study, the peroxide etching technique was adopted primarily to determine the depth of the electrical conductivity change produced by ion bombardment.

Results of this investigation showed that the etching rate is insensitive to concentration, but that it is sensitive to pH, yielding a minimum of about 0.021 micron/minute at pH 4, the region recommended for controlled etching experiments. The large pH effect on the peroxide etching rate of germanium indicates that the etching is largely controlled by the solubility of the amphoteric oxide surface layer. The etching rate was also found to be sensitive to temperature, showing a change of a factor 2 from 20° to 30°C, and to some foreign ions. For example, the rate is about twice as great when sulfate ions are present in the solutions as when phosphate ions are present.

Mechanically polished surfaces exhibit an enhanced etching rate. This enhancement is removed by heavy-ion bombardment, but not by light-ion bombardment. The etching rate of normal germanium surfaces is not affected appreciably by heavy-ion bombardment, but the etch pit density is greatly increased.

### Notes:

1. A study of the etching of germanium with hydrogen peroxide has been presented by W. Primak, R.

Kampwirth, and Y. Dayal in a report entitled "Peroxide Etching of Germanium," July 1966. The report includes a complete discussion of the results, recommendations for etching, and microinterferograms of the etched surfaces.

2. This information may be of interest to electronics industries, specifically those working with semiconductors.
3. Reference: Additional details are contained in the *Journal of the Electrochemical Society*, vol. 114, no. 1, p. 88-91 (January 1967).
4. Inquiries concerning this innovation may be directed to:

Office of Industrial Cooperation  
Argonne National Laboratory  
9700 South Cass Avenue  
Argonne, Illinois 60439  
Reference: B68-10454

Source: W. Primak and R. Kampwirth  
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(ARG-10170)

### Patent status:

Inquiries about obtaining rights for commercial use of this innovation may be made to:

Mr. George H. Lee, Chief  
Chicago Patent Group  
U.S. Atomic Energy Commission  
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9800 South Cass Avenue  
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Category 03