

## V. THERMOELECTRIC PROCESSES AND MATERIALS\*

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### RESEARCH OBJECTIVES

The research that will be described under the foregoing heading, of which this is the first report, will be concerned with some of those physical properties of materials that may be important in thermoelectric energy conversion.

The work of a small R. L. E. group, under the direction of Prof. Adler, is to be done with the consultation and cooperation of Prof. Pierre Aigrain, whose own group at the Laboratoire Central des Industries Électriques, in Paris, is simultaneously carrying out associated research. The two activities are maintaining close liaison, under a common sponsorship arrangement, and the progress of both groups will be reported here. The R. L. E. group is sharing the space and facilities of the Energy Conversion Group, of the Servomechanisms Laboratory, M. I. T., under the direction of Prof. D. C. White, since both programs are concerned with similar thermoelectric problems.

Present plans involve studies of the thermal and electrical parameters of mixed crystals of semiconductor compounds or elements, such as bismuth telluride ( $\text{Bi}_2\text{Te}_3$ ) and silicon-germanium alloys (Si-Ge), including preparation and evaluation of the materials. We are bearing in mind eventual interest in the operation of some materials at high temperatures, and this has affected, especially, our design of equipment for the evaluation of thermoelectric properties. At present, however, we are restricting the effort on the preparation of materials to simpler cases such as  $\text{Bi}_2\text{Te}_3$ , which is well enough investigated to serve as a basis for perfecting our own techniques.

In general, the theme of the research is to arrive at an understanding of the relation between the structure of a material and its relevant properties for thermoelectric applications. We expect, therefore, that some materials will be investigated with particular reference to only one of the parameters, even if such materials are not necessarily promising, in other respects, for the over-all energy conversion problem. Study of the thermal conductivity of Si-Ge is a case in point, and it is probable that Prof. Aigrain's work in France will include it.

During the summer quarter, which was the first under the present program, we have been occupied completely with orientation problems and relatively routine

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†Prof. Aigrain, of the Université de Paris, École Normale Supérieure, and of the Laboratoire Central des Industries Électriques, is also a part-time visiting professor in the Department of Electrical Engineering, M. I. T. He expects that the members of his group at Lab. Cent. des Ind. Élect. will be L. Godfroy and J. Tavernier.

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instrumentation. One part of the activity included technical discussions with Prof. Aigrain and members of his group abroad, and during his short visit to Massachusetts Institute of Technology.

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