

1/9 C 35-963

CONFERENCE ON SOLAR ENERGY: THE SCIENTIFIC BASIS.

AT THE

UNIVERSITY OF ARIZONA, TUCSON.

1955 OCTOBER 31 AND NOVEMBER 1,

MONDAY AND TUESDAY.

THE EFFICIENCY OF SOLAR THERMOELECTRIC GENERATORS

COMPOSED OF SEMICONDUCTORS.

TSUNEO MOMOTA and YASUO MATSUKURA
Electrotechnical Laboratory
Tokyo, Japan.

SECTION C Business Administration Building ROOM 110

DAY Monday HOUR 3:00 p.m.

Introduction

Various types of thermoelectric generators made of the metallic alloys have been investigated for many years with the aim of generating electrical energy. However, the efficiency of the conversion of heat energy into electric energy by such metallic thermocouples is extremely low. So nowadays the investigations on the thermocouples constructed of semiconducting materials have become the centre of interest because of their higher efficiency.

In order to discuss the efficiency problem of the thermogenerator we must investigate how its efficiency depends on the physical characteristics, such as thermoelectric power, electric resistivity and heat conductivity, of the semiconducting materials. We have derived some general theoretical equations for the efficiency of the semiconductor thermogenerators at maximum output both for the degenerate case and the non-degenerate case, and showed graphically the results of calculations for several useful cases.

In our experiments we have dealt with titanium dioxide semiconductors because of their easy manufacturing process and stable natures. The specimens have been prepared at various reducing temperatures. On each specimen measurements have been made of electric resistivity, heat conductivity, thermoelectromotive force and the generated power under a certain condition. It has been confirmed that higher output is obtained for the specimen, which is reduced at higher temperature and accordingly has lower resistivity, and that almost all of the conduction electrons of the specimen are in the degenerate states.

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