

# High Thermal Conductivity AlN Substrate and Its Metallized Products\*

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## 1 Introduction

As the demand increases for high speed, compact size, light weight and high reliability in electronic equipment, progress in producing semiconductor elements with larger size, higher integration and higher output is apparent. Accordingly, substrates on which semiconduc-

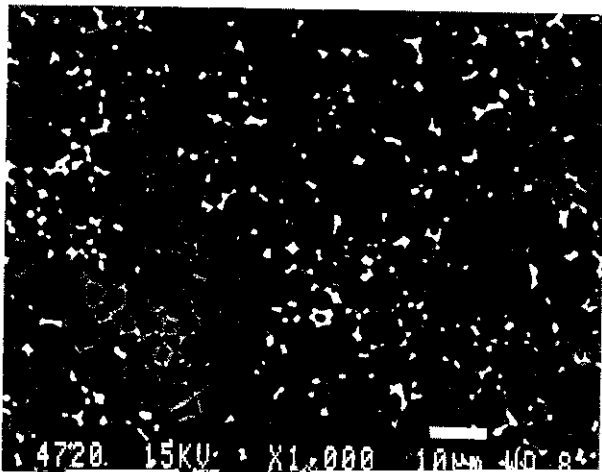
## 2 AlN Bare Substrate

### 2.1 Manufacturing Method

AlN substrate is manufactured, like an alumina substrate, by being formed according to the doctor blade (continuous forming) method, before dewaxing and sintering under normal pressure. However, the kind of

tor elements are to be mounted have also diversified. Aluminum nitride (AlN) ceramics show thermal con-

organic binder, and dewaxing and sintering methods used for an alumina substrate cannot be applied to the



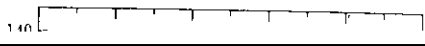
hence, the practical use of AlN substrates is later than was originally foreseen. However, progress in these metallizing techniques has enabled the practical use of the AlN substrate, in particular for power modules, to develop rapidly. Kawasaki Steel has perfected these metallizing techniques and is proceeding with the commercialization of metallized AlN substrates.

### 3.1 Copper-Bonded Substrate

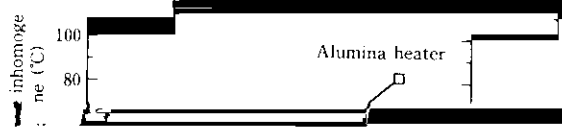
The Kawasaki Steel copper-bonded AlN substrate is manufactured by bonding with an Ag-Cu brazing material to which active metal is added. The major properties of this product are shown in Table 2. As the bare substrate, an AlN type with high thermal conductivity and high strength made by Kawasaki Steel has been

resistor fired on AlN substrate

plicated shapes is made possible not only by the molding methods used, but also by applying raw material



say because the AlN ceramic material itself is



### 5 Concluding Remarks

AlN-sintered ceramic and its various metallized