Thermoelectric properties of Bi_2Te_3 nanowire array in thickness direction

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Theoretical studies have predicted a possibility of increasing thermoelectric efficiency of nanostructure materials, owing to quantum confinement effect on the charge carriers and lattice vibrations[1][2]. On the other hand, Bi_2Te_3 is well known to be the most efficient thermoelectric material that can be operated around room temperature [3].

In this study, we have focused Bi_2Te_3 nanowire-arrays. Bi_2Te_3 nanowires were grown in the nano-holes of alumina template by electrodeposition. The electrodeposition can be described by the chemical reaction $3HTeO_2^+ + 2Bi^{3+} + 18e^- + 9H^+ \rightarrow Bi_2Te_3(s) + 6H_2O$ [4]. Seebeck coefficient and electrical conductivity of nanowire-arrays were measured in thickness direction using a custom made setup (Fig.1). The Seebeck coefficient $S = -57\ \mu V$ in the thickness direction at room temperature. The detail of thermoelectric properties of nanowire-arrays and will be presented.

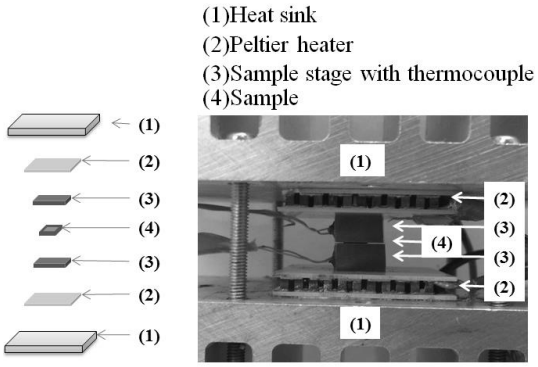

Figure 1 Schematic and photo image of the custom made setup.

Acknowledgement:
This work has been supported by the bilateral Spanish–Japanese NANOTHERMA projects of Strategic International Reserch Cooperative Program and KAKENHI for Challenging Exploratory.

References:

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