다이아몬드 탐침을 활용한 실리콘 열전계수 측정기법 개발

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Development of Thermoelectric Coefficient Measurement Technique for Silicon Using Diamond Coated Probe

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Key Words: Thermoelectric coefficient(열전계수), Scanning Probe Microscopy(주사탐침현미경)

Abstract : Nanoscale thermoelectric coefficient measurement has two important applications. First, it is necessary in the development of nano-structured thermoelectric materials that are known to have high ZT. Second, it can be used in the analysis of nano electronic devices, because of the close relationship between Seebeck coefficient and dopant density. Although recently developed technique, SThEM shows nanoscale resolution, it is not suitable for silicon which is the material of choice in semiconductor industry. In this study we are developing new technique utilizing diamond coated probe which is suitable for silicon. The D.C measurement results indicate that a new technique that can isolate thermoelectric voltage from built-in potential and photo-ionization is needed. Presently, A.C measurement technique that can directly measure thermoelectric voltage without the interference of built-in potential and photo-ionization is being developed.

보호층이 차등 3ω 기법으로 측정된 유전체 박막의 열전도도에 미치는 영향

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Influence of Upper Protective Layer on Measurement of Thermal Conductivity of Thin Dielectric Films Using Differential 3ω Method

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Key Words: Thermal Conductivity(열전도도), Thin Dielectric Film(유전체 박막), Differential 3ω Method(차등 3ω 기법), Protective Layer(보호층)

Abstract : The thermal conductivity of silicon dioxide thin film covered by additional protective layer is measured by differential 3ω method. The upper layer should be inserted inevitably between heater and thin film in some cases; when the thin film is a well-oxidized material or an electrically conductive material. However, the verification of using differential 3 omega method for these cases had not been conducted. In this paper, differential 3ω method is verified to be reliable when the thermal conductivity of thin film with protective layer is measured as long as the preconditions of the upper layer are satisfied.