Automatic Temperature Measurement of SiC Wafer During Millisecond Thermal Processing Based on Optical-Interference Contactless Thermometry (OICT)

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Background＞Precise temperature measurement of wafers during millisecond thermal processing is always a matter of great importance. However, techniques which can be applied for this application is limited, especially in plasma process. Hitherto, our laboratory has developed a technique for reproducing three-dimensional temperature distribution in wafer during millisecond thermal processing by human fitting, called OICT. In this work, a general way to conduct automatic temperature measurement will be proposed based on OICT. Furthermore, millisecond thermal annealing technique using Thermal Plasma Jet (TPJ) will also be utilized to illustrate how the automatic temperature measurement is achieved.

Experiment＞Figure 1 shows the automatic temperature measurement process when SiC wafer (thickness 380μm, resistivity 0.02Ωcm, double side polishing, off angle 4°) is irradiated by TPJ with scanning speed at 100 mm/s, Ar flow rate at 1.0 L/min and TPJ-substrate distance at 2.0 mm. Optical interference fringes are observed by high-speed camera in OICT. Optical interference image and three-dimensional temperature distribution of SiC wafer was simulated under various experimental conditions and stored in database (MySQL 8.0.22). Image preprocessing program has been developed with Computer Vision library OpenCV 4.5.0. Fitting program to find the simulation result that is most similar to the experimental one from the database is still under development based on pattern matching. In this way, corresponding three-dimensional temperature distribution of SiC wafer can be reproduced. Detailed results and discussions on this automatic temperature measurement technique will be addressed in the presentation.

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Reference＞[1] A. Kameda, *et al*., Journal of Applied Physics 127.20 (2020): 203302.

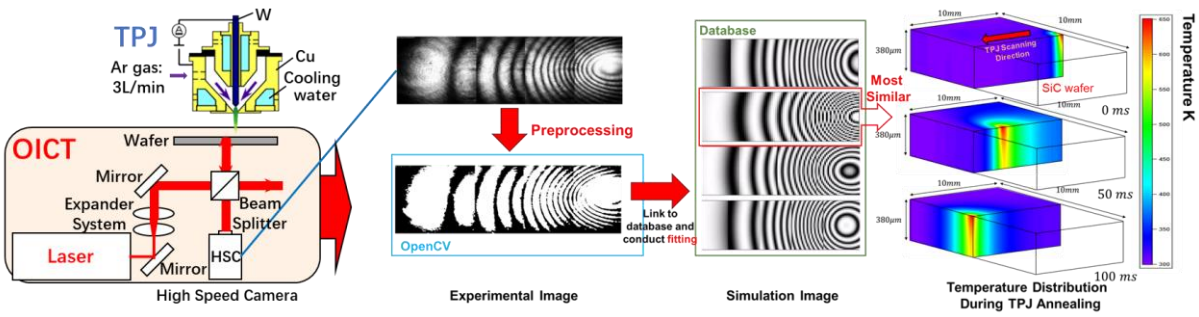

Fig. 1. Automatic temperature measurement of SiC wafer during TPJ annealing based on OICT