

Development of In Situ High-Temperature Transmission Electron Microscopy at the University of Tsukuba in SIP-IMASM Project

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High-resolution transmission electron microscopy (TEM)

→all the kinds of information on the atomistic dynamics of microstructures, i.e.) crystal structures, textures, compositions, surfaces, interfaces, grain boundaries, and point defects

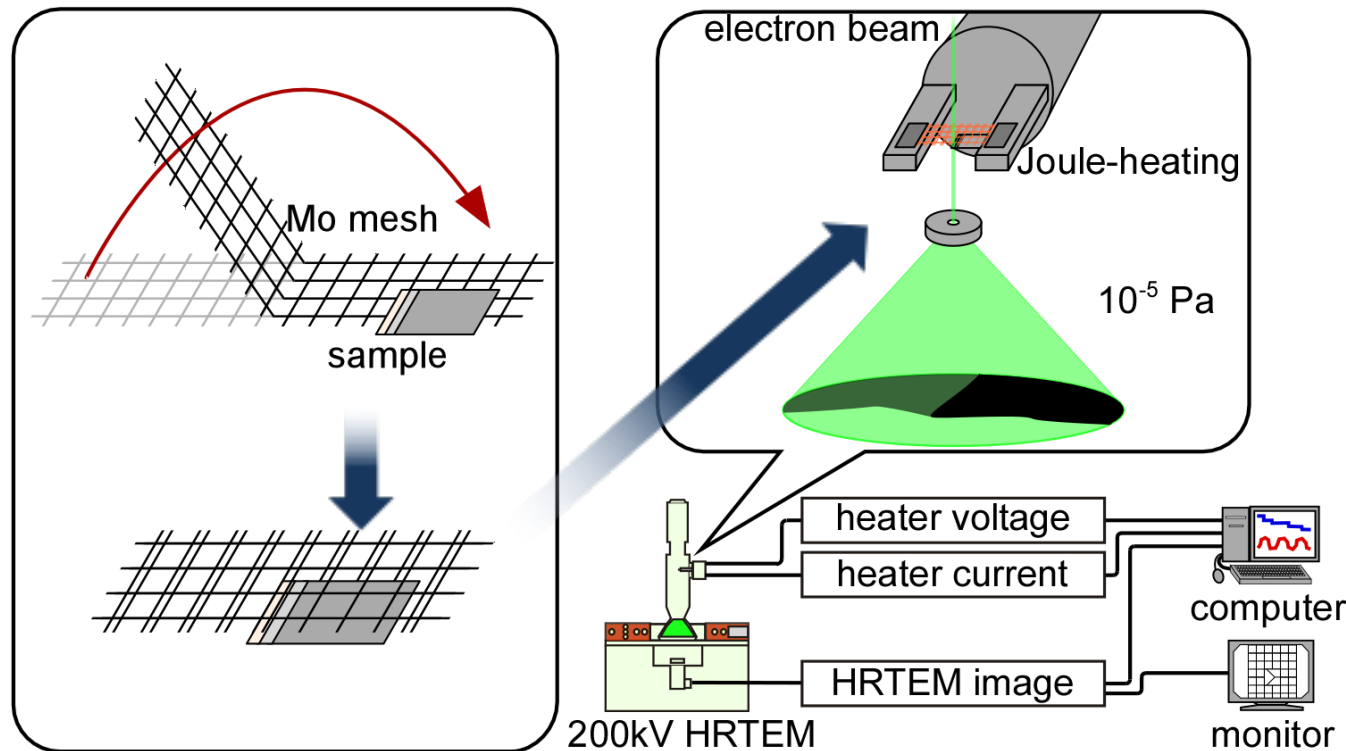
High-temperature environments

subjects to advanced structural materials, which are the target materials of SIP (e.g.) heat-resistant structural metals and alloys, and thermal barrier coatings using in jet engines.

***In situ* TEM**

Enables the analysis of the microstructural dynamics in various environments in which materials are actually used

However, the typical maximum temperature of commercial heating stages has still been limited under 1200 K, which is at least 500 K lower than the temperatures required for the studies of recent advanced heat-resistant structural materials, such as jet engine and aircraft materials.



Schematic of the *in situ* high-temperature TEM

The authors have taken over the challenge and have made various improvements of the previous heating system

e.g.) the choice of heater materials and shapes,
the mounting techniques of the heater,
the purpose-built power cable assemble,
and the dedicated power supply system.

We have achieved the possible heating temperature up to 2000 K [1–6], which is the maximum temperature of the heating stage of TEM that have been already constructed. In this presentation, we report the development process of the *in situ* high-temperature high-resolution TEM and the application to heat-resistant structural materials.

References

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