

Development of *In Situ* High-Temperature Transmission Electron Microscopy Using Micrometer Regional Pinpoint Heating

Hideki Kobayashi¹⁾, Manabu Tezura¹⁾ and Tokushi Kizuka¹⁾ †

1) Division of Materials Science, Faculty of Pure and Applied Sciences,
Univ. of Tsukuba (1-1-1, Tennoudai, Tsukuba, Ibaraki 305-8573, Japan)

†E-mail: kizuka@ims.tsukuba.ac.jp

***In Situ* High-Temperature Transmission Electron Microscopy (TEM)**

- direct observation of the microstructural dynamics at high temperature at which heat-resistant materials are actually used
- during heating of TEM samples, the amount of outgas increases
 - needs to decrease the amount of thermal emission
 - we developed a micrometer-scale regional pinpoint heating technique

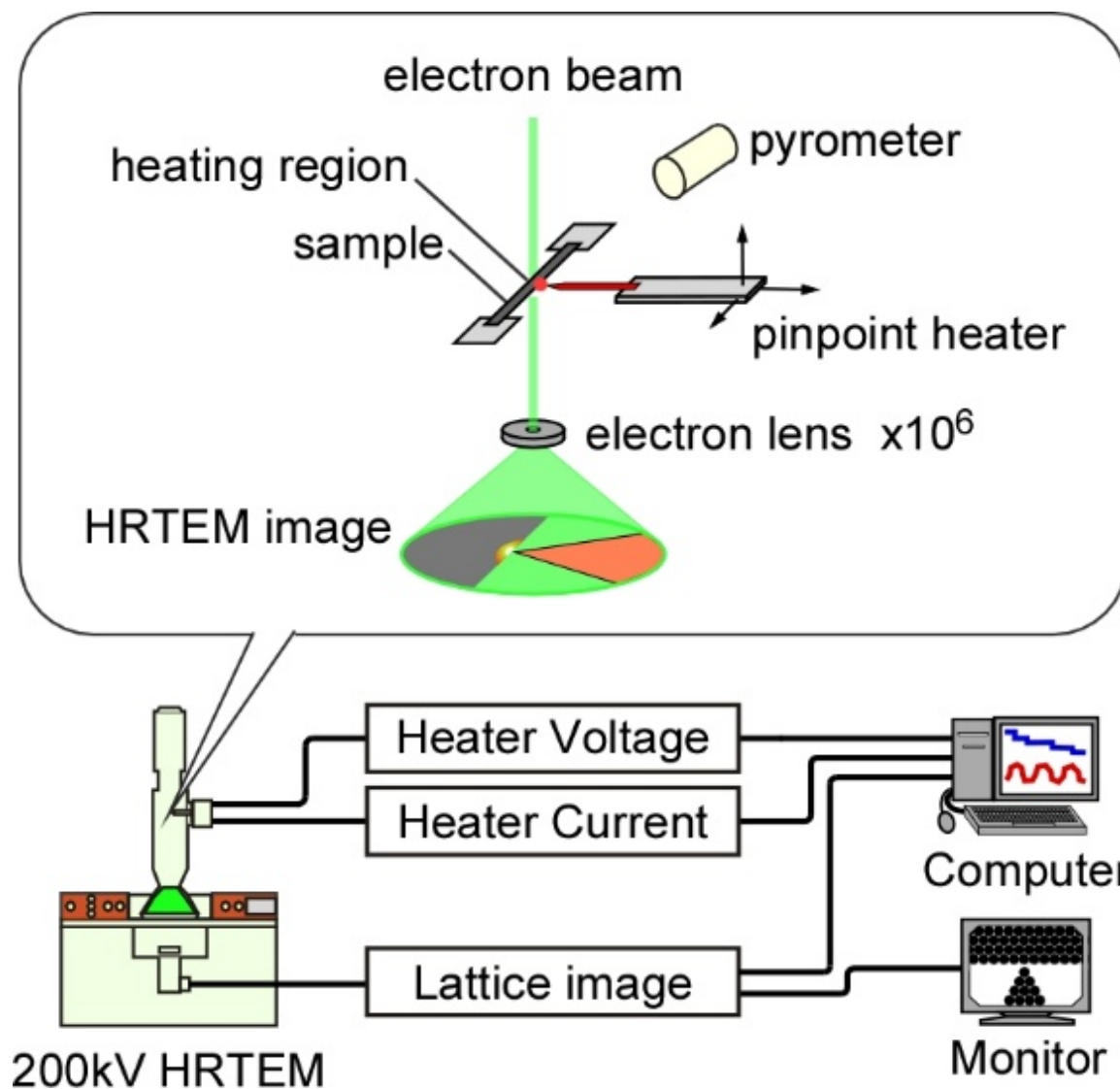
Anatase-to-rutile(TiO_2) phase transformation

the process of the phase transformation depends on particle size, atmosphere, heating conditions, etc

- thermodynamics and crystallography have also attracted rising attention
- the atomistic transformation behavior have remained unclear

The purpose of this study

reveal the microstructural dynamics of the transformation of TiO_2 at high temperature by using pinpoint heating method



Schematic of pinpoint heating of sample for high temperature *in situ* TEM

Microstructural behavior of TiO_2 nanoparticles during the transformation process at high temperature was researched.

TiO_2 nanoparticles can be heated even when the heating source isn't in contact.

The existence of crystal habit suppresses the transformation of TiO_2 nanoparticles; anatase \rightarrow rutile.