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Development and application of a new 200kV TEM/STEM system with an LaB_6 electron gun

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Transmission electron microscope is an essential tool for the research of semiconductors, materials and biological sciences. We have developed a wide-purpose and highly efficient electron microscope with a Schottky type field emission gun; JEM-2100F in 2002. On the other hand, an electron microscope with an LaB_6 electron gun has advantages such as a high stability of beam current, bright images at low or medium magnifications. In addition, the accelerating voltage can be changed easily. An optimum accelerating voltage can be selected quickly to observe beam-sensitive materials such as carbon nanotubes, polymers and etc.

We have newly developed a wide-purpose electron microscope JEM-2100, which has an LaB_6 electron gun. Figure 1 shows an appearance of a JEM-2100 equipped with a STEM image observation device and an energy dispersive X-ray spectrometer(EDS) system. The JEM-2100 is supported by new technologies which are a PC control system of electron optics, a highly stabilized goniometer, a base frame with a passive air mount and STEM image observation device, as same as JEM-2100F. An electron optical system of STEM image observation device for JEM-2100 was modified from JEM-2100F to have the optimum probe size and current. The graphic user interface is displayed on a PC monitor of the main instrument as shown in Fig.2. The functions for frequent use are arranged on the operation panels as showing Fig.3. Five types of the objective lenses are available, which are for ultra high resolution, high resolution, high tilt, cryo and high contrast. Figure 4 shows a high resolution lattice image of Au[220] using an ultra high resolution pole-piece. The JEM-2100 is well intergrated with EDS system(JED-2300T), and both can be operated on the same PC monitor. Figure 5 shows elemental maps of sialon, taken by an EDS analyzer JED-2300T. JED-2300T with $50mm^2$ detector performs highly sensitive analysis, where the detection solid angle is 0.28sr for high resolution pole-piece. Consequently, the JEM-2100 is an effective tool for the wide-purpose researches.

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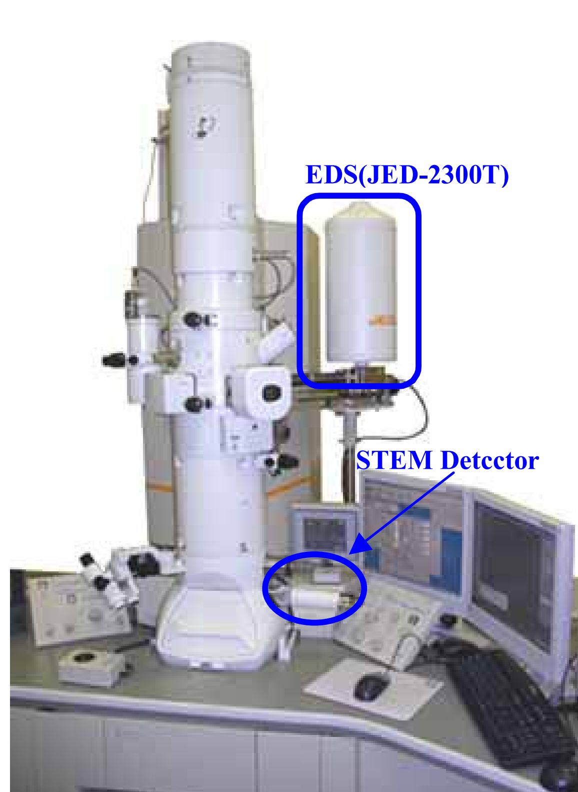

Fig.1 JEM-2100 electron microscope with STEM detector and EDS(JED-2300T)

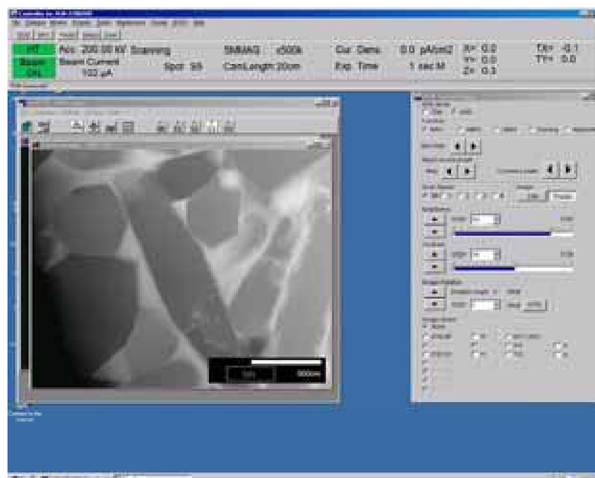

Fig.2 Graphic user interface on PC monitor

Fig.3 operation panel

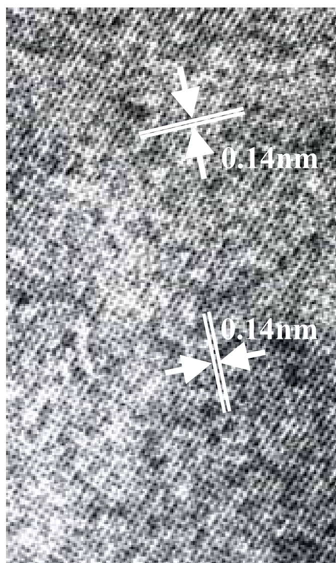

Fig.4 Lattice image of Au[220]

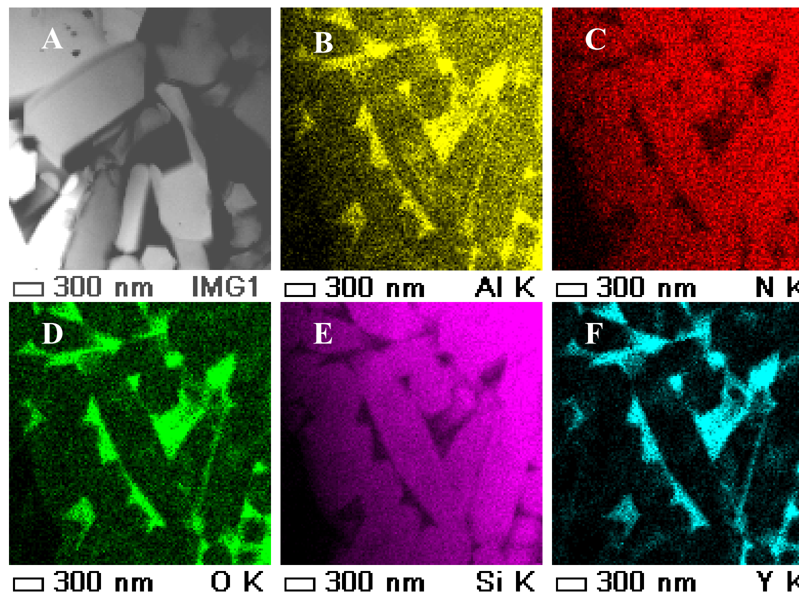

Fig.5 EDS elemental mapping of Sialon by JEM-2100 and JED-2300T
A. STEM-BF image B. Aluminum mapping C. Nitrogen mapping D. Oxygen mappingE. Silicon mapping F. Yttrium mapping

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