Special Issue on New Trends for Structural and Chemical Analyses by Transmission Electron Microscopy

PREFACE

This special issue includes selected papers from the 12th Japanese-Polish Joint Seminar on Micro and Nano Analysis. The seminar was held at Kyushu University Nishijin Plaza in Fukuoka, Japan from August 29 to September 1, 2018. This is a biennial event and alternately organized in Japan and Poland: Warsaw (September, 1997), Kyoto (December, 1998), Krakow (July, 2000), Toyama (November, 2002), Niedzica (August, 2004), Toyama (September, 2006), Warsaw (September, 2008), Kyoto (September, 2010), Sieniawa (September, 2012), Sapporo (October, 2014), and Gniew (September, 2016). The seminar consisted of 40 oral presentations including 23 invited talks and 11 posters, and nearly 50 participants have registered for the seminar. As the name of the seminar, the main participants are Japanese and Polish, but there were also attendees from the United States of America, Australia, and Indonesia.

Since the physical properties of materials strongly depend on atomic arrangements and the distribution of impurity atoms, it is of technological importance to obtain structural and chemical information for developing new structural and functional materials. Among various characterization techniques, transmission electron microscopy (TEM) and scanning transmission electron microscopy (STEM) can simultaneously measure these information from the same location of an object with the high accuracy at the atomic scale. Because of this excellent spatial resolution, TEM and STEM are one of the important technologies indispensable for promoting materials science and engineering. This seminar was aimed at discussing recent progresses in structural and chemical analyses using microscopy and microanalysis techniques and their application to the field of materials science. We dealt with the following topics: “Severe Deformation”, “Deformation, Stress, and Dislocation”, “Relationship between Structure and Functionality”, “Nanowire, Interface, and Low-dimensional Materials”, “Spectroscopy”, and “Processing”. The latest results obtained by the state-of-the-art technology, such as spherical aberration ($C_s$) corrected TEM and STEM, three-dimensional tomography, electron holography, and ultrahigh voltage STEM, were presented in the seminar. In addition, we reconﬁrmed the usefulness of electron diffraction, dark-ﬁeld TEM, and high-resolution TEM analyses used in conventional electron microscopy.

This seminar also provided an opportunity for scientists to establish valuable contacts, developed international collaborations, and improved their international cooperative projects. We hope that collaborative researches will be promoted based on this seminar, and look forward to discussing new results at the next seminar to be held in Poland in 2020.

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