Present and Future Views of the Division of Materials Science and Crystal Technology

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To grow large, highly pure single crystals has been the dream of human beings since the Egyptian era. Of course in ancient times, the technology primarily focused on jewelry. Today, we still appreciate beauty, just as scientists did long ago. People who are involved in the Materials Science and Crystal Technology (MSCT) division, in particular, will never forget the dream and will always be fascinated by the beauty of crystals.

The MSCT division originated in 1956 from a small research group called the Ammonium Dihydrogen Phosphate (ADP) society. Therefore, MSCT has developed of the course of about 50 years. In 1970, MSCT was officially approved as a division of the Japan Society of Applied Physics (JSAP). The MSCT division started with about 100 members. At that time, the main focus was on the growth of $LiNbO_3$, GMO, and garnets. In other words, we grew new oxide crystals using the Czochralski method and often discussed their optical and/or magnetic properties. Today, the MSCT division is an organization with 550 members.

The most impressive thing that happened during the past 35 years was the wide and rapid development of electronics, in terms of both technology and business field. Crystal growth technologies have supported this dynamic movement by advancing the technologies required to grow large and defect-free bulk crystals. In the 1970s, the diameter of defect-free Si bulk crystals was only 4 inches, but today we can produce crystals of up to 12 inches. As a result, senior members who joined MSCT at the beginning remain interested in these bulk growth technologies. Now, modern semiconductor devices are manufactured by using a variety of materials and technologies. In particular, thin films and the techniques to manipulate ultra-thin films have become increasingly important. Initially, many of our younger members tend to be more interested in thin films and epitaxial technologies. However, through the activities of MSCT, many of them have begun to take more of an interest in bulk materials.

The MSCT division holds five meetings a year, mainly for members though nonmembers can take part as well. In addition to these meetings, we hold one or two symposiums in conjunction with the JSAP annual meetings. The symposiums are open to all participants in the JSAP meetings.

The most unique and important point of all these meetings is the MSCT school, which attracts and encourages developing engineers and scientists. It is a two-day seminar that includes 11 lectures, and more than 100 young people participate in it every year. The themes of the lectures include basic theories for crystal growth, X-ray analysis, electron diffraction, reciprocal lattice space, Fourier analysis, epitaxial growth, band theory, the optical and electrical evaluation of crystals, and so forth. Some of these lectures are followed by exercises that help the participants to understand them.

We have another tutorial program, called the "MSCT seminar", that includes more application-oriented talks. This year, we held a seminar entitled "How to Choose Analytical Techniques Suitable for Solving Your Problem". In the seminar, we will first give some basic technological background, followed by some actual applications of the techniques.

We will also hold two meetings for particularly hot topics, in both the Tokyo and Kansai (Osaka and Kyoto) areas. This year the themes were; "ZnO for Semiconductor Applications" (Tokyo) and "Wide-Bandgap Semiconductors for Power Devices, from Bulk Crystals to Device Technologies" (Kyoto).

To explore the next generation key technologies related to crystal and materials science, we have also planned a short (half-day) meeting during the Christmas season. This will be held after a famous lecture by Michael Faraday entitled "The Chemical History of a Candle" (1860). This year, the theme of this Christmas meeting, to be held in Yokohama, is "Science in Cosmetic Nano-Crystals."

At the same site as the JSAP spring meetings, we will have a luncheon meeting to report our annual activities and balance the MSCT members' budget. We typically invite special speakers, who describe unique applications of crystals. This year, Professor N. Takahashi of Shizuoka University gave a talk entitled "Bonsai Crystals: Nano-Flowers Made by InN Crystals" in Tokyo.

In addition to these meetings, we publish a journal called the "Crystal Letters". We publish and deliver three newsletters to MSCT members each year. These newsletters include, technical papers, meeting reports, laboratory introductions, technical notes, and a reader comment called "Coffee Break".

We are now planning to have a 50th anniversary meeting in December 2005. We would like to invite all of our colleagues who are interested in crystal technologies and materials science to the meeting. We will also publish a special commemorative issue of Crystal Letters, in which we will review the history and development of the MSCT division. Soon, we will call for papers related to the memorable events that have happened during the past 50 years, such as the development of bulk growth technologies, epitaxial technologies, device technologies, evaluation technologies, simulations, and so on.

At present, all MSCT activities are organized by 19 MSCT members forming the management staff. Needless to say, the huge amount of planning and organization required to efficiently run MSCT would be impossible without the dedication and hard work of these people. As mentioned earlier, we still have a great deal of work to do in preparation for the 50th anniversary events scheduled for next year. Therefore, we plan to add two additional staff members to our management team. We would appreciate the understanding and cooperation of all MSCT members in accomplishing this. We would also like to thank all of our members for their help and support over this past year.

In the future, materials science and crystal technologies will become more and more important, especially for nano-technologies and the biochemical fields. In these areas, the symmetry of nano-scale materials will be required to develop new functions and applications, which will impact both electronic and non-electronic devices. We would like to be prepared for these new demands through our meetings and discussions. We greatly appreciate help, advice and comments from all members and researchers who are interested in materials and crystals. JSAP