FOREWORD

Special Section on Fabrication of Superconductor Devices; Key Technology in Superconductor Electronics

Superconductor devices exhibit higher accuracy, lower noise, or faster response than semiconductor devices. Superconductor-based voltage standards, superconducting quantum interference devices (SQUIDs), detectors, and signal processors are already in practical use, and their further development is expected. This achievement is attributed to the effort of related researchers and engineers for reliable fabrication technology and an increase in the integration scale. The editorial policy of this journal stands on making readers possible taking a look around it. From this viewpoint, five superior papers are selected which focus on the fabrication technology on superconductor devices with various materials suitable for various applications.

As a structure and material of the Josephson junction (J.J.), i.e., the element of superconducting circuits which acts similar to a "transistor" in semiconductor circuits, niobium/aluminum oxide/niobium ($Nb/AlO_X/Nb$) junction sandwich is popular from the quality, high controllability, and reproducibility. An invited paper by Dr. M. Hidaka and a contributed one from Dr. S. Nagasawa describe the fabrication and the application of $Nb/AlO_X/Nb$ J.J.-based integrated circuits to signal processors. An invited paper by Dr. Y. Uzawa focuses on a superconductor/insulator/superconductor (SIS) mixer made of $Nb/AlO_X/Nb$ junctions whose current-voltage characteristic is strongly nonlinear and exhibits extremely low conversion loss in millimeter and submillimeter wave range. An electrode material of the tuning circuit which compensates the large capacitance of SIS junction is NbTiN in part. The advantage of NbTiN over Nb is lower electrode loss for electromagnetic wave whose frequency is above the gap frequency of Nb, i.e., 700 GHz. When the barrier material AlO_X is replaced by a magnetic material, such a "magnetic" J.J. exhibits a unique phenomenon. An invited paper by Professor T. Yamashita reviews such a "magnetic" J.J. and its application to new circuits for signal processors. Many superconducting detectors consist of elements except for J.J.s. One considers adopting superconducting materials which contribute to improving the performance and/or operating temperature of such detectors. As an example, an invited paper by Professor H. Shibata describes a superconducting nanowire photon counter for near-infrared light with faster response and lower dark counts than semiconductor avalanche photodiodes.

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Satoshi Kohjiro *(Member)* received the B. E., the M. E., and the D. E. degrees in electronics from Kyushu University in 1984, 1986, and 1989, respectively. In 1989, he joined the Electrotechnical Laboratory, presently the National Institute of Advanced Industrial Science & Technology (AIST), where he has been working on the development of analog superconductor devices such as SQUIDs, oscillators, and detectors. From 2018, he has been a Principal Research Manager of Device Technology Research Institute, AIST. His current research interest is the multiplexing readout of detector array and its application to both basic and industrial sciences.