EDITORIAL

Journal of Semiconductors
(2019) 40, 080101
doi: 10.1088/1674-4926/40/8/080101

Preface to the Special Issue on Challenges and Possibilities of Magnetic Semiconductors

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Magnetic semiconductors have been pursued for over 50 years because they combine two critical components of modern information technology: semiconductors for logic and magnets for memory. Remarkably, boosted by the discovery of ferromagnetism in the (III,Mn)As system two decades ago, magnetic semiconductors have become one of leading material systems which are critical for future applications in energy efficient information technology, quantum computing, and quantum communication. However, after more than a decade of rapid development, the ongoing research in magnetic semiconductors must now face reality: "Is it possible to create magnetic semiconductors that work at room temperature?" To answer this question, great efforts have recently been made in theory and experiments to discover and design new material platforms to host magnetic ions. These recent advances have thus revived our understanding of the field and lifted the field off for a new opportunity.

Here we organized a specific topic on magnetic semiconductors, including the contributions of 11 groups of researchers, which generally cover the main and/or future research directions in magnetic semiconductors. Specifically, we have one comment overviewing the families of magnetic semiconductors, and one review paper covering the history regarding the development of magnetic semiconductors. In addition, two reviews report the research progress on magnetization dynamics and interlayer exchange coupling in (Ga,Mn)As based structures. Two other reviews focus on recent theoretical calculation and materials design of new diluted magnetic semiconductor (DMS) systems such as narrow band gaps DMSs, two-dimensional DMSs, and new types of DMSs with decoupled charge and spin doping. One review overviews the recent research efforts in DMS by nuclear magnetic resonance (NMR) and muon spin rotation (μSR). Another review covers recent progress in the study of Mn doped chalcogenide topological insulators (TIs). We also have two reviews summarizing recent research on two dimensional ferromagnetic materials. Finally, a review covers the synthesis and research in high Curie-temperature ferromagnetic amorphous alloys.

We sincerely hope that this special topic could provide useful information to the readers working in materials science and inspire many more to enter the field of magnetic semiconductors. We would like to thank all the authors who have contributed high-quality peer-reviewed articles to this special topic. We are also grateful to the editorial and production staff of *Journal of Semiconductors* for their superb assistance.