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Thermoelectric coating based on the spin Seebeck effect AKIHIRO KIRIHARA, NEC Corporation, KEN-ICHI UCHIDA, YOSUKE KAJIWARA, Tohoku University, MASAHIKO ISHIDA, YASUNOBU NAKAMURA, TAKASHI MANAKO, SHIGERU KOHMOTO, NEC Corporation, EIJI SAITOH, Tohoku University, SHINICHI YOROZU, NEC Corporation
— Thermoelectric (TE) technologies have been drawing great interest, since they can directly generate electricity from thermal energy that is available in various places. However, their complicated module structure, which is based on a number of thermocouples, still makes it difficult to fabricate large-area TE devices at low cost. In this work, we show a novel concept based on the spin Seebeck effect (SSE) called TE coating, which is characterized by a simple film structure, convenient scaling capability, and easy fabrication. We fabricated a TE-coating film with a bismuth-substituted yttrium iron garnet (Bi:YIG) by a highly productive spin-coating-based process on a nonmagnetic substrate, and demonstrated the SSE-induced TE conversion. The TE-coating layer amounts to only 0.01 % of the total sample thickness, suggesting that such an ultrathin magnetic film can work as a useful thermal-energy collector. This new concept may enable us to implement low-cost and large-area TE functions on various objects, opening opportunities for innovative energy harvesting applications.

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