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Spin Transport in Insulators Mediated by Magnetic Correlations Probed by $Y_3Fe_5O_{12}$-based Spin Pumping CHUNHUI DU, HAILONG WANG, P. CHRIS HAMMEL, FENGYUAN YANG, The Ohio State University — Spin currents carried by mobile charges in ferromagnetic (FM) and nonmagnetic (NM) materials have been the central focus of spintronics, while spin transport in insulators is largely unexplored. FMR spin pumping has awakened intense interest in magnon-mediated spin currents in both conducting and insulating FMs and in antiferromagnets (AF). Building on the large spin pumping signals enabled by our $Y_3Fe_5O_{12}$ (YIG) films, we report a systematic study of spin transport in six series of Pt/insulator/YIG trilayers where the insulators include one diamagnet, one paramagnet and four AFs. We observe remarkably robust spin transport in the AFs and a distinct linear relationship between the spin decay length in the insulator and the damping enhancement in the YIG, suggesting the critical role of magnetic correlations in AF insulators for spin transport. Strikingly, the insertion of a thin NiO layer between YIG and Pt significantly enhances the spin currents driven into Pt, suggesting exceptionally high spin transfer efficiency in YIG/NiO/Pt structures.

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