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Novel spin currents in non-collinear antiferromagnets JAKUB ZELEZNY, YANG ZHANG, CLAUDIA FELSER, BINGHAI YAN, Max Planck Institute for Chemical Physics of Solids, Dresden Germany — Many key spintronics phenomana are caused by spin currents. Here we study spin currents in non-collinear antiferromagnets Mn_3Sn and Mn_3Ir. It was recently demonstrated that a large spin Hall effect exists in these materials. We show by symmetry analysis and microscopic ab-initio calculations that in these antiferromagnets, also a different type of spin currents occur, which have an origin and symmetry distinct from the spin Hall effect. These spin currents are similar to spin-polarized currents in ferromagnets, however, unlike in ferromagnets, they also contain a transversal contribution (i.e., a spin current flowing in the direction transversal to the charge current). Our calculations reveal that both the spin-polarized currents and the transversal spin currents are large in the studied materials. These spin currents could have important applications since the effects that originate from the spin-polarized current in ferromagnets, like the tunneling magnetoresistance or the spin-transfer torque, will also be present in the non-collinear antiferromagnets. Furthermore, the transversal spin currents will contribute to the spin-orbit torque generated by the spin Hall effect.

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