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Sign change of spin Hall effect due to electron correlation in CuIr alloys ZHUO XU, BO GU, MICHIYASU MORI, Japan Atomic Energy Agency, TIM ZIMAN, Institut Laue Langevin, SADAMICHI MAEKAWA, Japan Atomic Energy Agency — Recently the predominant extrinsic skew scattering mechanism with a positive spin Hall angle (SHA) was experimentally observed in nonmagnetic CuIr alloys [Niimi et al., Phys. Rev. Lett. 106, 126601 (2011)], while the negative SHA was obtained by ab initio simulation if the consistent definition of SHA is used [Fedorov et al., Phys. Rev. B 88, 085116 (2013)]. We reconsider the SHA in CuIr alloys by the quantum Monte Carlo method, where the Coulomb correlation U in 5d orbitals of Ir impurities is properly included. It indicates that the SHA is negative without electron correlation (U=0), and becomes positive when an electron correlation of U=0.5 eV is included, which is consistent with the experiment. It opens a way to control the sign of SHA by electron correlation in novel spintronic devices.

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