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Topological optoelectronics in atomistic van der Waals materials

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Abstract: In recent years, materials that exhibit a non-trivial topological band-structure and non-zero Berry-curvature have attracted a lot of attention. These properties render the materials a very promising and robust platform for spintronic applications independent of the exact details of material composition or extrinsic influences such as temperature [1]. In my talk, I will show a photo-induced anomalous Hall effect in the prototypical Type-II Weyl semimetal WTe₂ [2], as well as a quantized conductance in terms of e^2/h in the topological insulators Bi₂Se₃ and (Bi,Sb)₂Te₃ as revealed by the Shockley-Ramo theorem [3]. I will further demonstrate how the relaxation of the phonon- and charge-carrier-baths [4] influences the spin transport in such topological materials as in terms of the spin Hall effect [5].

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[5] P. Seifert, et al. Nature Communications 9, 331 (2018).

