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Nanomechanical spin-polarizer ALEXEY KOVALEV, LIVIU ZÂRBO, Department of Physics, Texas A&M University, College Station, TX 77843-4242, USA, YAROSLAV TSERKOVNYAK, Department of Physics and Astronomy, University of California, Los Angeles, California 90095, USA, GERRIT BAUER, Kavli Institute of NanoScience, Delft University of Technology, Lorentzweg 1, 2628CJ Delft, The Netherlands, JAIRO SINOVA, Department of Physics, Texas A&M University, College Station, TX 77843-4242, USA — We study the effects of time dependent strain on transport properties in a long semiconductor rod and predict a piezo-spin effect. Torsional oscillations of a free-standing semiconductor beam are shown to cause spin-dependent oscillating with time potentials that spin-polarize an applied charge current in the presence of intentional or disorder scattering potentials. One can apply AC voltage synchronized with the mechanical motion to obtain a DC spin current. The thus created spin accumulation in the leads can be detected by e.g. ferromagnetic side contact or by the optical Kerr rotation. We propose to build the mechanical spin generators and manipulators based on the piezo-spin effect.

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