Abstract Submitted
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Experimental observation of very large magnetoconductance in microbial nanowires[1] NIKHIL MALVANKAR, Depts. of Physics and Microbiology, University of Massachusetts, Amherst MA 01003, MADELINE VARGAS, DEREK LOVLEY, Dept. of Microbiology, University of Massachusetts, Amherst MA 01003, MARK TUOMINEN, Dept. of Physics, University of Massachusetts, Amherst MA 01003 — Microbial nanowires are 2-5 nm-wide conductive proteinous pili filaments secreted by some bacteria, which can grow tens of micrometers long and may serve as a conduit for long-distance electron transport. Our previous studies demonstrated that pili of Geobacter sulfurreducens exhibit properties akin to disordered metals, and indicated a temperature-driven crossover from the regime of weak localization (WL) to strong localization (SL). Here we report a very large positive magnetoconductance (MC), up to 10,000 %, at 300K. MC increased exponentially with magnetic field. A crossover from positive MC (WL regime) to negative MC (SL) was observed at $\sim$ 280K when the localization and the phase-breaking lengths are expected to become comparable. We attribute positive MC to destruction of the quantum interference of delocalized electron wavefunctions and negative MC to shrinkage of the localized electron wavefunctions due to applied magnetic field, which is consistent with the temperature dependence of conductivity.

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