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Systematic study of doping dependence on linear magnetoresistance in *p*-PbTe

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ABSTRACT

We report on a large linear magnetoresistance effect observed in doped p -PbTe films. While undoped p -PbTe reveals a sublinear magnetoresistance, p -PbTe films doped with BaF₂ exhibit a transition to a nearly perfect linear magnetoresistance behaviour that is persistent up to 30 T. The linear magnetoresistance slope $\Delta R/\Delta B$ is to a good approximation, independent of temperature. This is in agreement with the theory of Quantum Linear Magnetoresistance. We also performed magnetoresistance simulations using a classical model of linear magnetoresistance. We found that this model fails to explain the experimental data. A systematic study of the doping dependence reveals that the linear magnetoresistance response has a maximum for small BaF₂ doping levels and diminishes rapidly for increasing doping levels. Exploiting the huge impact of doping on the linear magnetoresistance signal could lead to new classes of devices with giant magnetoresistance behavior.

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