

Hall effect spintronics for gas detection.

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We present the concept of magnetic gas detection by the Extraordinary Hall effect (EHE). The technique is compatible with the existing conductometric gas detection technologies and allows simultaneous measurement of two parameters: resistivity and magnetization affected by the target gas. Monitoring two independent parameters is expected to improve selectivity of the gas sensors. Feasibility of the approach is demonstrated by detecting low concentration hydrogen using thin CoPd films as the sensor material. The Hall effect sensitivity of the optimized samples exceeds 240% per 10^4 ppm at hydrogen concentrations below 0.5% in the hydrogen/nitrogen atmosphere, which is more than two orders of magnitude higher than the sensitivity of the conductance detection.

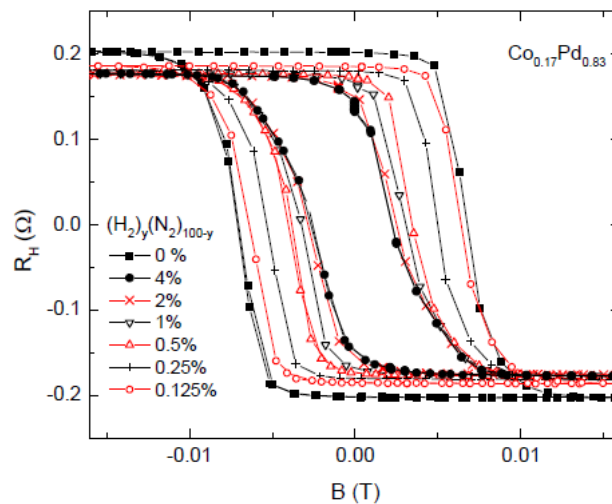


Figure 1. EHE resistance hysteresis loops measured in 5 nm thick $\text{Co}_{0.17}\text{Pd}_{0.83}$ film in H_2/N_2 atmosphere with different H_2 concentrations ($y = 0\%$, 0.125% , 0.25% , 0.5% , 1% , 2% and 4%).