

**Adjustable magnetic interactions:
The use of hydrogen as a tuning agent**

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Abstract

The use of hydrogen to modify the electronic structure in magnetic thin films and heterostructures has opened new routes to tailor material properties. Hydrogen can be used to alter the electronic structure and thereby allowing a control of e.g. the strength and character of magnetic interactions. This effect can be used to change the coupling strength in thin films, as well as selectively altering one of the constituents in artificial heterostructures. For example, the switching from AFM to FM order, and vice versa, has been demonstrated for exchange coupled magnetic superlattices. As the sign of the exchange interlayer coupling, J' , can be switched by the insertion of hydrogen, J' arbitrarily close to zero must be accessible. When $J'=0$, the exchange interaction between adjacent magnetic layers is completely suppressed. The heterostructure can then be taken to consist of a collection of quasi two-dimensional magnetic sheets. Consequently, the introduction of hydrogen can be viewed as a route to tune the dimensionality of these structures.

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