Abstract

20 years ago [1] Datta and Das by suggesting an 'electronic analog of the electro-optic modulator' have proposed the concept of a spin-FET which makes use of spin-orbit coupling to modulate the current of spin-polarized electrons and which is still considered the paradigm of spintronic devices. The first prerequisite for a successful implementation, i.e. the efficient spin injection into the semiconductor, has been demonstrated in several experiments which will be briefly reviewed. A novel scheme will be presented which by using the polar magneto-optic Kerr effect on a cleaved edge allows to measure 2D cross-sectional images of the spin polarization in the semiconductor even below a metallic contact [2]. This method is used to determine the spin diffusion length and spin lifetimes in GaAs as a function of electron energy. A controversy related to the bias dependence of the spin polarization will be addressed by comparing spin injection data from epitaxial FeCo(001), Fe(001) and (Ga,Mn)As(001) ferromagnetic contacts on n-GaAs(001). The potential of the imaging method for the route towards a functional spin-FET will be outlined.


There will be coffee, tea, and cookies in front of the lecture hall at 17.00 h

gez. R. Gross