UNIVERSITÄT DUISBURG ESSEN

PHYSIK E=

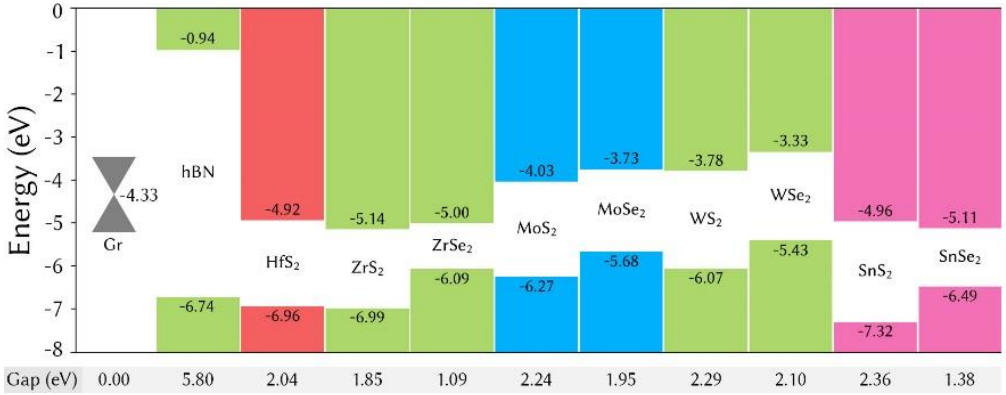
Physikalisches Kolloquium

Mittwoch, 16.10.2019
13:00 Uhr
Hörsaal MC 122

Festkolloquium aus Anlass des 85. Geburtstages von Prof. Dr. Winfried Mönch

Band line-up at interfaces of 3D & 2D materials

Prof. Dr. Friedhelm Bechstedt, Friedrich-Schiller-Universität, IFTO, Jena, Germany



The action of modern nanostructured electronic and optoelectronic devices are ruled by metal-semiconductor and semiconductor-semiconductor interfaces. Central for the understanding of their properties is the transition of the electronic bandstructure from one material into that of the other one, the band line-up. It defines barriers for electrons or holes, Schottky barrier heights and band discontinuities (or band offsets), respectively. Their determination and understanding from bulk electronic properties by means of branch points or charge-neutrality levels were important research topics of Prof. Winfried Mönch during his career.

The relation of these energies to the use of the vacuum level for the band alignment, the Anderson or electron affinity rule, as well as the comparison with band-edge profiles computed ab initio by means of electronic-structure calculations and projection techniques are important to characterize semiconductor heterostructures.
The different methods, their resulting „natural“ and „true“ band offsets, and the electronic consequences are introduced and described for three-dimensional (3D) semiconductor heterostructures, for silicon-transparent oxide interfaces as examples. The straddling, staggered or broken-gap band arrangement rules the electronic and optical properties of these heterocombinations.