Heterogeneous catalysis is a field where substantial developments have been achieved in terms of fundamental understanding, and which is indispensable for a number of environmental and industrial applications. Catalysts are traditionally chemically promoted with minute quantities of additives to enhance their lifetime (structural promoters), activity and selectivity (electronic promoters). Intensive research has, however, been performed in the last three decades on a solid-state-electrochemical phenomenon called the electrochemical promotion. Thereby, chemisorptive and catalytic properties of metal and metal oxide catalysts were reversibly altered in a very pronounced manner, which has attracted the interest of various research fields, i.e. electrochemistry, surface science and catalysis. Various aspects of this phenomenon will be introduced in this talk within the context of recent developments.