# The Magnesium Sulfide Accumulator – An Alternative to Lithium

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The cost-effective storage of electrical energy is an essential premise to realize the energy revolution in Germany. To meet the energy consumption by generating fluctuating regenerative energy like solar and wind power, appropriate storage systems are needed. Electrochemical energy storage offers multiple advantages since it is local and independent from geographical conditions, but most available storing systems do not provide enough storage capacity with respect to their price. Therefore the development and manufacturing of a high power accumulator with high energy density, good efficiency, long term stability and competitive price is essential.

In the magnesium sulfide accumulator divalent magnesium ions are used as energy storage instead of monovalent lithium ions in lithium ion batteries. Contrary to known magnesium accumulators a sulfide ion is used for charge transfer. Hence magnesium is oxidized to magnesium sulfide on the cathode side and copper sulfide is reduced to copper on the anode side. One key part is the calculation and simulation as well as the synthesis of a suitable electrolyte e.g. on the basis of ionic liquids. The accumulator is a cheap alternative to current LIB because the whole system does not contain any rare elements like e.g. cobalt. The theoretical energy density of the electrode material is 1.2kWh/kg. The battery is expected to give 150Wh/kg. This makes it competitive to LIB.

First results on the processing of magnesium and copper sulfide electrodes will be presented. The electrodes are made from metal sulfide powder and are coated on a metal foil in a slurry of active material, conductive carbon, binder and solvent. Homogenous distribution of the active material is analyzed using Raman mapping and optical methods like laser microscopy. Measurements of the cycle stability in the system are performed using a mixture of a sulfur containing salt in an aprotic solvent as electrolyte.