The Direct Carbon Fuel Cell: Synthesis and Characterization of Novel Molybdenium based Perovskites as Anodes.

The Direct Carbon Fuel Cell (DCFC) is a new technology to convert i.e. biomass directly into heat and electricity, which is independent from intermittent sources and thus highly suitable to form the backbone of the future energy system (Fig. 1). The technology is unique in terms of **economy** (theoretically 100% efficiency in carbon oxidation; almost pure CO_2 is captured without need for separation and further processing), **environment** (pure CO_2 emission makes sequestration easy resulting in negative CO_2 balance and no NOx formation) and **societal safety** (no CO_2, no NOx).

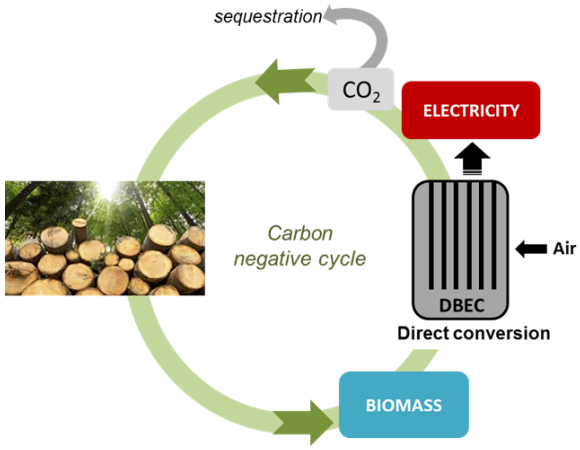

Figure 1. *Schematic overview of the carbon negative cycle. DBEC is a direct biomass electrochemical converter. A carbon negative cycle is possible if the CO_2 formed from the oxidation of the solid biomass is sequestrated.*

The ***main objective*** of the project to syntesize at least twenty novel anode materials for direct carbon oxidation based on molybdenium based perovskites and determine their crystal structure.

Different anodes based on $La_{2-x}Sr_xFe_{2-y-z}Mo_yM_zO_{6-\delta}$ double perovskites will be synthesized, and characterized. Increased stability might be possible if some of the iron is replaced with chromium. Detailed characterization of the perovskites using powder XRD (combined with Rietveld refinements), surface area determination (BET), dilatometry, thermogravimetry in reducing atmosphere, four point DC-conductivity measurements and scanning electron micrsscopy (SEM) will be undertaken.
Selected anode materials will furthermore be studied using model electrodes.