Electronic Supplementary Material (ESI) for ChemComm.

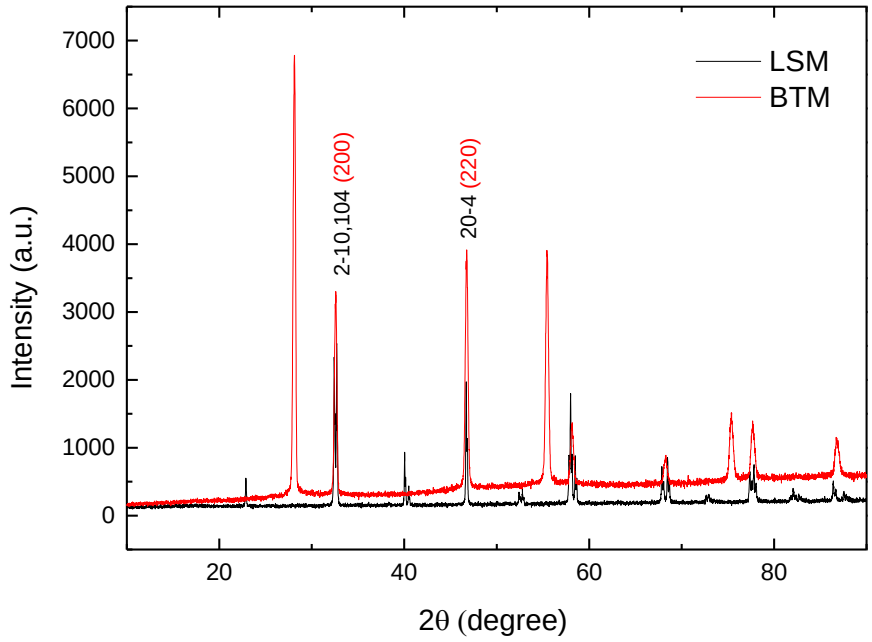

Figure S1: Superimposed XRD patterns of LSM and BTM.

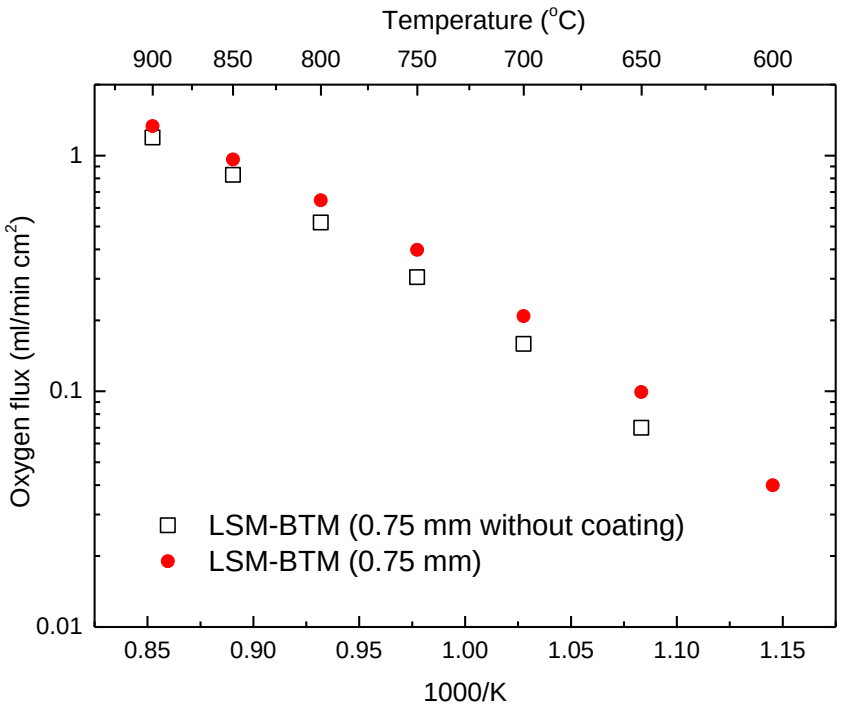

Figure S2: Oxygen flux plotted as a function of inverse temperature of the 0.75mm membrane with and without a porous layer coating of the same material.

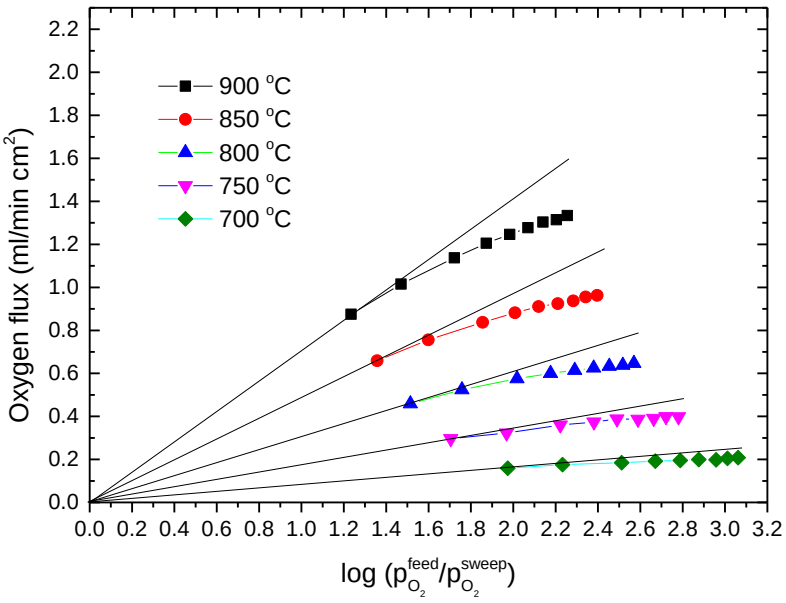

Figure S3: Oxygen flux plotted as function of the logarithm of the oxygen partial pressures across the membrane. The straight lines are eye guides for theoretically predicted oxygen flux trends without considering effects of surface kinetics.

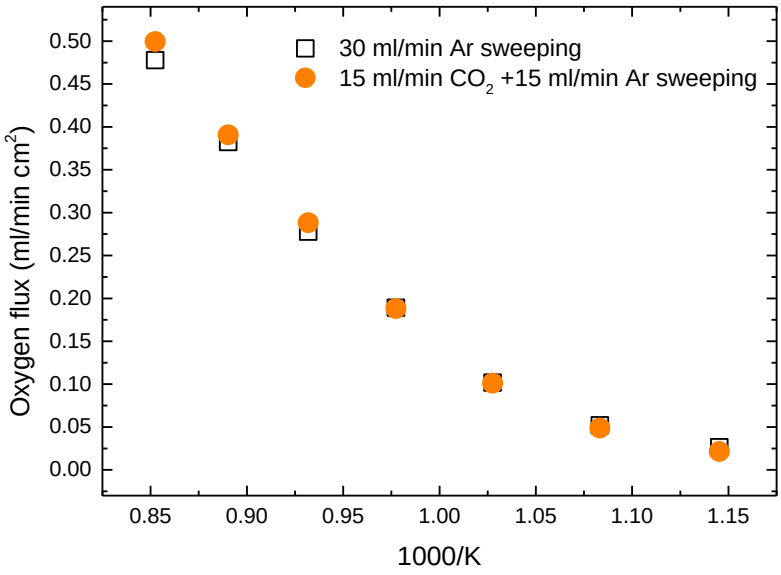

Figure S4: Oxygen fluxes in the temperature range from 900 to 600 °C with sweep gas of pure Ar and a mixture of 50% CO_2 and 50% Ar.

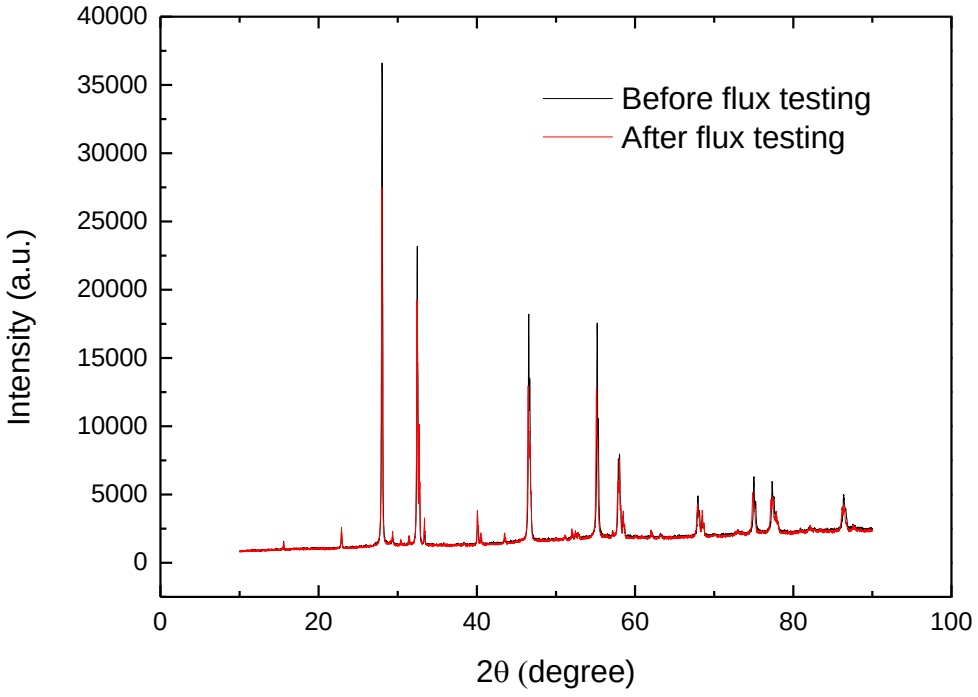

Figure S5: XRD patterns of the membrane before and after long-term oxygen flux testing.

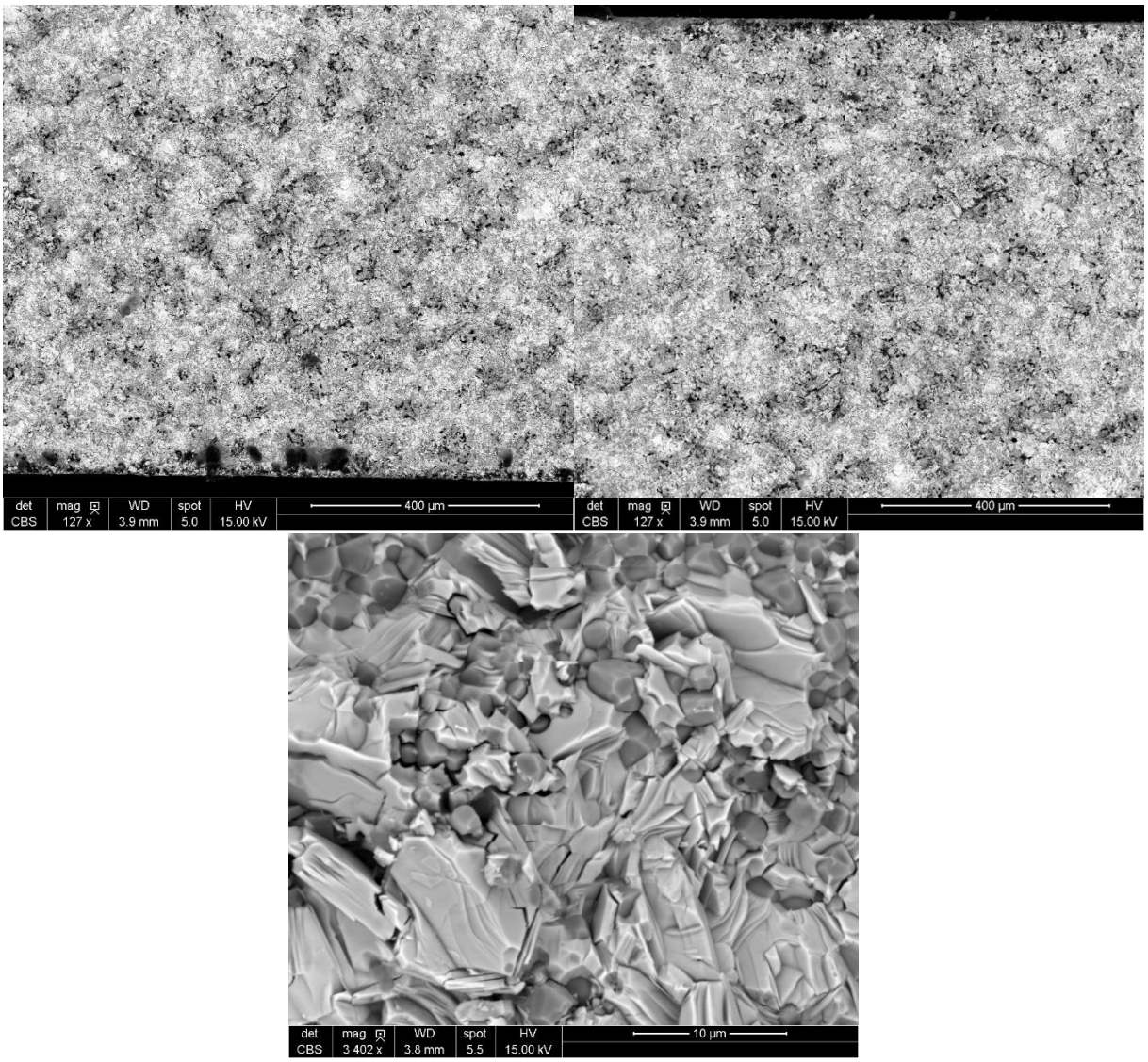

Figure S6: SEM cross sections of the membrane after flux testing. The top left picture shows the sweep side and top right picture shows the feed side. The bottom picture shows a typical high magnification view of the composite membrane. Carbonate phases were not observed. Black particles towards the surface were adventitious carbon from the sample handling.