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Characterization of the selectivity of a hollow fiber perovskite membrane: development of a new extraction and measurement system for triple isotopic composition of oxygen

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The triple isotope oxygen signature of the troposphere results from the balance between (1) the flux of biologically produced oxygen associated with various mass dependent fractionation processes, exhibiting different relations between $^{18}O/^{16}O$ and $^{17}O/^{16}O$ ratios; (2) the flux of stratospheric oxygen associated with non mass dependent fractionation processes linked to ozone formation. By measuring the triple oxygen isotopes variations, it is thus possible to infer the relative proportion of the two exchange fluxes. Luz *et al.* [1999] used the anomaly $^{17}\Delta$ in the relation between $\delta^{17}O$ and $\delta^{18}O$ in the troposphere to assess the global biospheric productivity. $^{17}\Delta$ signal is small, with a 40 per meg change between last glacial and interglacial climate [Blunier, 2002], thus requiring precise extraction and measurement system. Here we present a new oxygen separation technique based on tubular perovskite (BCFZ ; $BaCo_xFe_yZr_{1-x-y}O_{3-\delta}$) mixed ion and electron conducting membrane (MIEC), characterized in theory by 100 % selective oxygen permeation. At operating temperature (850 ˚C), the oxygen permeation flux is driven by the differential partial pressure of oxygen across the hollow fiber membrane. Here we specifically focus on the selectivity of the membrane at different temperature and O_2 partial pressure by quantifying the separation factor of oxygen over nitrogen.