Electronic Supplementary Information

CAPTURE AND ELECTROCHEMICAL CONVERSION OF CO_2 IN MOLTEN ALKALI METAL BORATE-CARBONATE BLENDS

Lev Bromberg, [a] Michael P. Nitzsche [b] and T. Alan Hatton *[a]

[a] *Department of Chemical Engineering, and* [b] *Department of Mechanical Engineering, Massachusetts Institute of Technology, 77 Massachusetts Avenue, Cambridge, MA 02139Address here.*

Details of the electrolysis experiments

i) The salt powder was loaded into a nickel crucible and placed into the furnace. After purging with N_2 flow for 30 min, the furnace was then heated to the designated temperature (550 or 600ºC) within 75 min and held isothermally for 60 min to melt the salt and release residual water.

ii) After cooling, freezing, and disassembly, a hole was drilled in the solidified salt and used to insert the cathode, which was then locked into place by a mica lid with holes for gas exchange. This ensured full submersion of the cathode regardless of variations in packing density of the initial salt powder.

iii) After assembly, the electrolysis cell was loaded into the tube, and N_2 was purged for another 30 min at room temperature. The furnace was then heated to 550°C or 600ºC in 75 min and held isothermally for 60 min to ensure full melting before cyclic voltammetry measurements were taken.

iv) The gas flow was then switched to 50 cc/min of 100% CO_2 and held isothermally for 3 h before additional cyclic voltammetry measurements were taken. The electrolysis process was conducted in the galvanostatic mode with a constant current of -240 mA applied for 1 h, and the cathode was manually lifted out of the salt prior to cooling and freezing.

v) The carbonaceous product and residual salt were removed from the cathode by sonication in deionized water (0.5 h). The product was then purified from the residual salt by 3 to 4- day dialysis of the suspension against excess of aqueous 1% nitric acid (membrane cut-off, 12-14 kDa) followed by the particle removal, washing in deionized water, and lyophilization.