## Supplementary Information

# Supported Ionic Liquid Membranes for Removal of Dioxins from High Temperature Vapor Streams

### Characterization of the Ceramic Supports

1) Flat membrane, diameter = 30 mm, porosity = 45%, thickness = 2 mm (Support: α-$Al_2O_3$ with 2.5 μm pore size; Top layer: $TiO_2$ with 30 nm pore size)
2) Flat membrane, diameter = 30 mm, porosity = 45%, thickness = 2 mm (Support: α-$Al_2O_3$ with 2.5 μm pore size; Top layer: α-$Al_2O_3$ with 100 nm pore size)

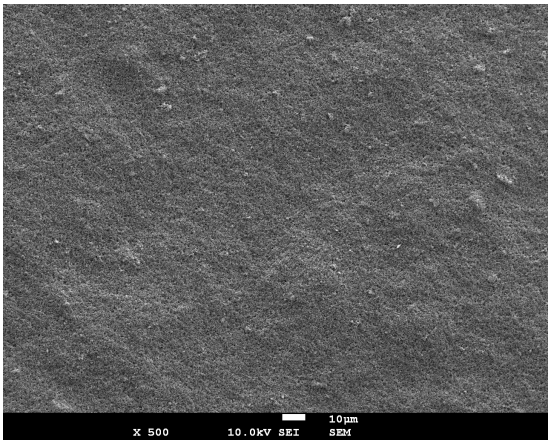


**Figure S1**: SEM upper view of a 30 nm $TiO_2$ membrane

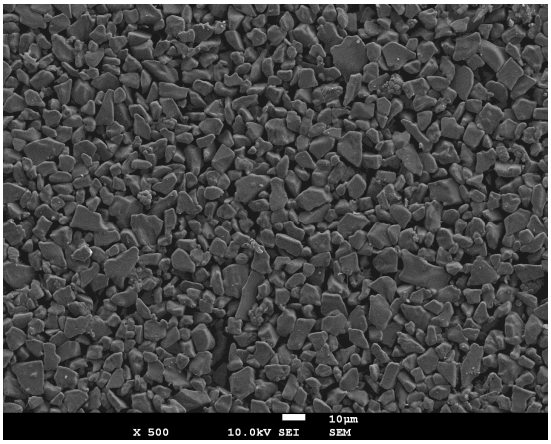


**Figure S2**: SEM upper view of a 100 nm $Al_2O_3$ membrane

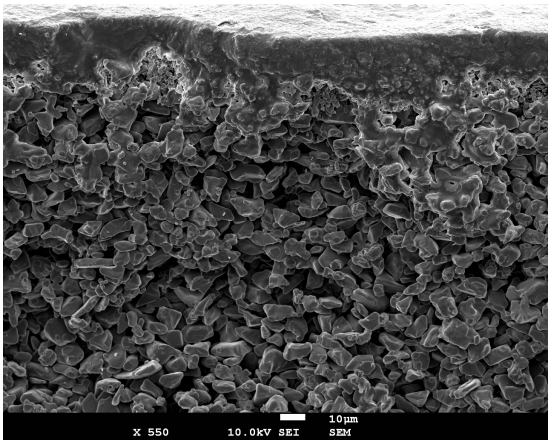


**Figure S3**: SEM cross-section of a 30 nm $TiO_2$ membrane

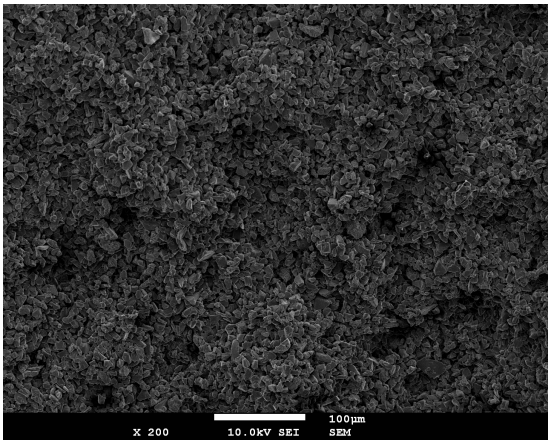


**Figure S4**: SEM cross-section of a 100 nm $Al_2O_3$ membrane

## Characterization of the ceramic membranes with immobilized ionic liquids

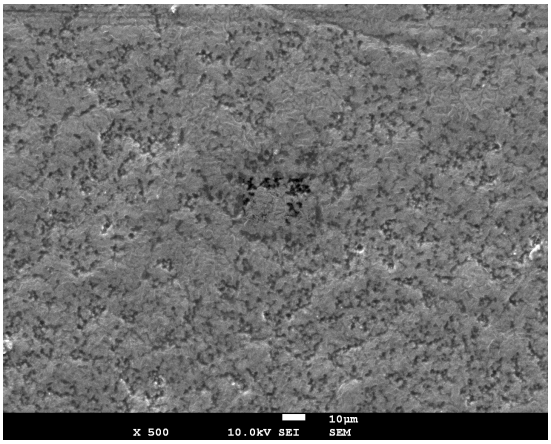


**Figure S5**: SEM upper view of a 30 nm $TiO_2$ membrane with [Aliquat][DCA] immobilized

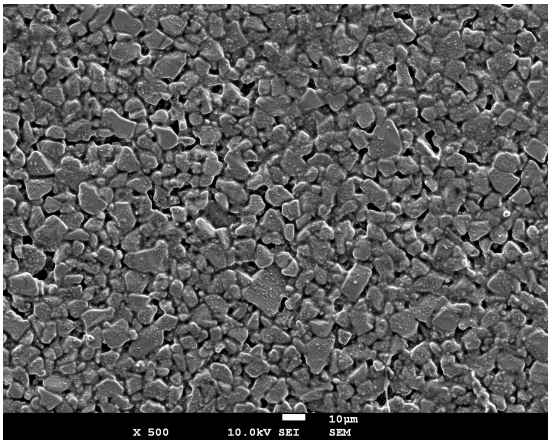


**Figure S6**: SEM upper view of a 100 nm $Al_2O_3$ membrane with [Aliquat][DCA] immobilized

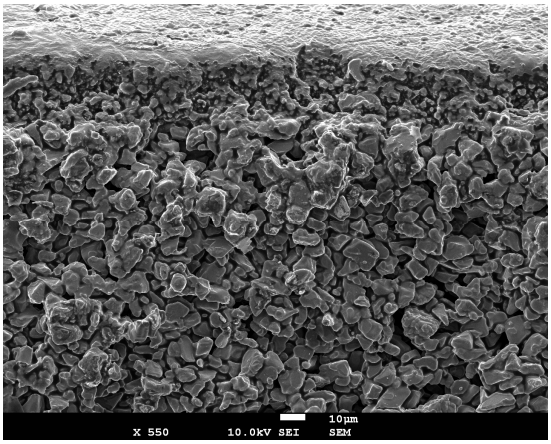


**Figure S7**: SEM cross-section of a 30 nm $TiO_2$ membrane with [Aliquat][DCA] immobilized

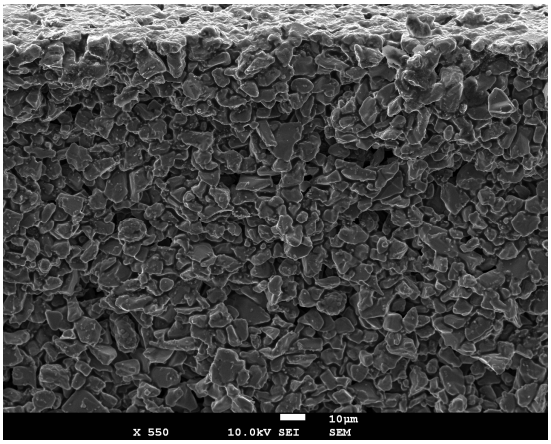


**Figure S8**: SEM cross-section of a 100 nm $Al_2O_3$ membrane with [Aliquat][DCA] immobilized

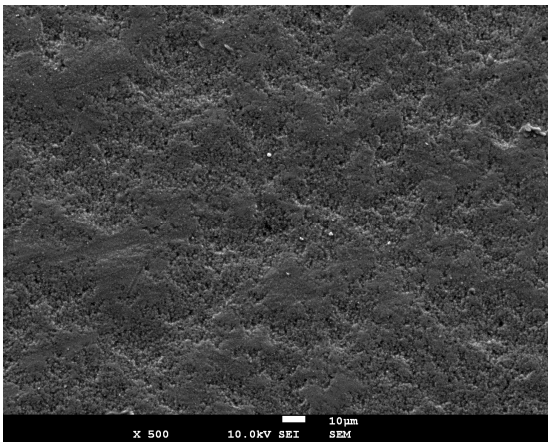


**Figure S9**: SEM upper view of a 30 nm $TiO_2$ membrane with [OMIM][DCA] immobilized

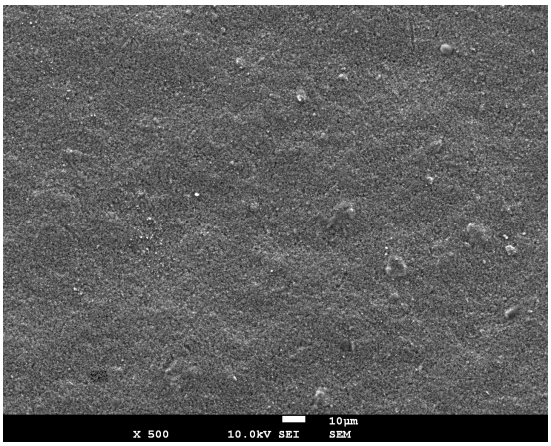


**Figure S10**: SEM upper view of a 100 nm $Al_2O_3$ membrane with [OMIM][DCA] immobilized

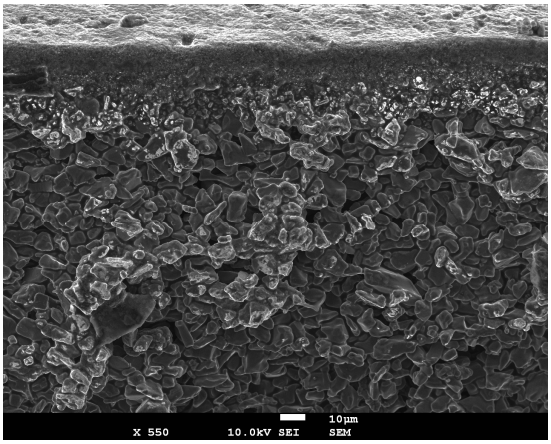


**Figure S11**: SEM cross-section of a 30 nm $TiO_2$ membrane with [OMIM][DCA] immobilized

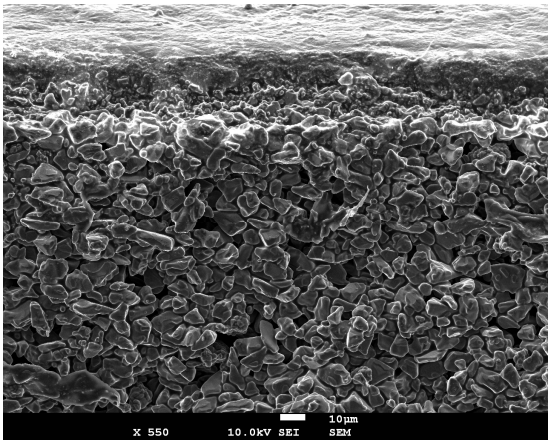


**Figure S12**: SEM cross-section of a 100 nm $Al_2O_3$ membrane with [OMIM][DCA] immobilized

**Table S1:** Physico-chemical properties of the dioxins used in the present study.

| **Property** | **Dibenzo-*p*-dioxin** | **2-chlorodibenzo-*p*-dioxin** |
|---|---|---|
| CAS No. | [262-12-4] | [39227-54-8] |
| Molecular formula | $C_{12}H_8O_2$ | $C_{12}H_7ClO_2$ |
| Molecular Weight | 184.19 $g.mol^{-1}$ | 218.64 $g.mol^{-1}$ |
| Melting Point | 122 ºC | 89 ºC |
| Boiling Point | 283.5 ºC | 315.2 ºC |
| Vapor Pressure (at 25 ºC) | $4.13 \times 10^{-4}$ mmHg | $1.28 \times 10^{-5}$ mmHg |
| Solubility in $H_2O$ (at 25 ºC) | 0.901 $mg.L^{-1}$ | 0.319 $mg.L^{-1}$ |
| Toxicity Equivalence Factor (TEF) | 0 | 0 |
| Log P (Octanol-Water) | 4.30 | 5 |
| $LD_{50}$ (Rat) | 1000 $mg.kg^{-1}$ | $< 0.1$ $mg.kg^{-1}$ |

**Dioxin Analysis: GC-TCD Specifications**

Standard: Benzophenone (5 mg)

GC-TCD:

(Column Carbowax-10: L 45 m, ID 0.32 mm; Injector: 240 ºC; Column 230 ºC; Detector 270 ºC; Linear Velocity: 25.5 $cm.sec^{-1}$; Flow Rate: 0.9 $ml.min^{-1}$; Injection Mode: Split; Split Ratio: 50 Retention Times (min): (Dichloromethane 3.19, Dioxin 8.41, 2-chlorodibenzodioxin 13.10, Benzophenone 11.05)