NEW NON-POROUS MEMBRANES FOR FLUE GAS PURIFICATION

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Abstract A new and unique apparatus for testing of flat sheet dense membranes with humid mixture air-SO_2/CO_2 was constructed [1]. A polymer of intrinsic porosity with tetramethyltetrahydronaphthalene and bicyclic triptycene units (PIM-TMN-Trip) shows excellent separation properties for CO_2/N_2 as well as for SO_2/N_2 gas pairs. Determined permeability of CO_2 (with values ranging from $16.5 \cdot 10^3$-$18 \cdot 10^3$ Barrer, caused by adging oth material) was somewhat lower compared to the literature [2]. Mixed gas selectivity corresponds to the reported ideal selectivity with values located between 2008 Robeson's upper bound [2] and recently redefined CO_2/N_2 upper bound for pure gases [3]. The permeability of SO_2 in a model mixture air-SO_2/CO_2 was very high ($28 \cdot 10^3$ -$30 \cdot 10^3$ Barrer) and the SO_2/CO_2 mixed gas selectivity was low (ca. 1.8) but comparable with other novel membranes which have shown good separation properties for CO_2 separation [4]. The effect of feed pressure on CO_2 or SO_2 permeability was found negligible, but the stage cut strongly increases due to the very high permeability of the membranes. Obtained results in mixed gas separation conditions show promising potential of PIM-TMN-Trip membranes for efficient flue gas purification.

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