

Article

# The effect of C/Si ratio and fluorine doping on the gas permeation properties of pendant-type and bridged-type organosilica membranes

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**Citation:** Rana, I.; Nagaoka, T.; Nagasawa, H.; Tsuru, T.; Kanezashi, M. The effect of C/Si ratio and fluorine doping on the gas permeation properties of pendant-type and bridged-type organosilica membranes. *Membranes* **2022**, *12*, 991. <https://doi.org/10.3390/membranes12100991>

Academic Editor(s): Shigeyuki Uemiyu

Received: 6 September 2022

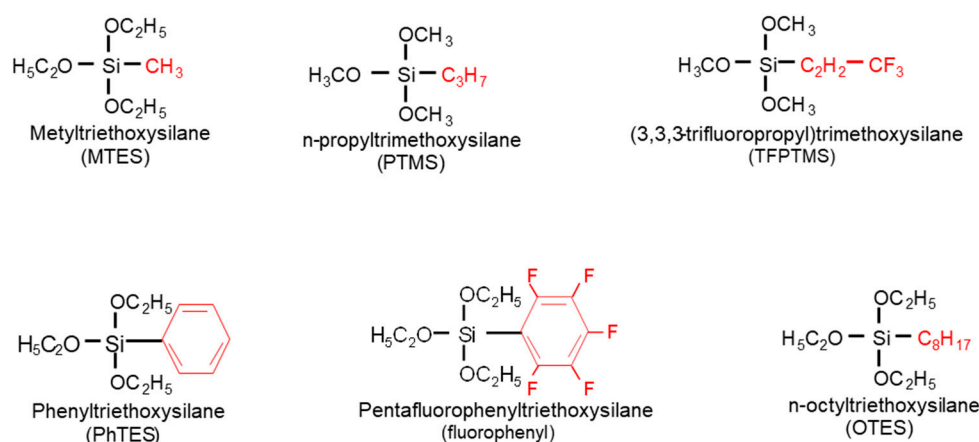
Accepted: 5 October 2022

Published: 13 October 2022

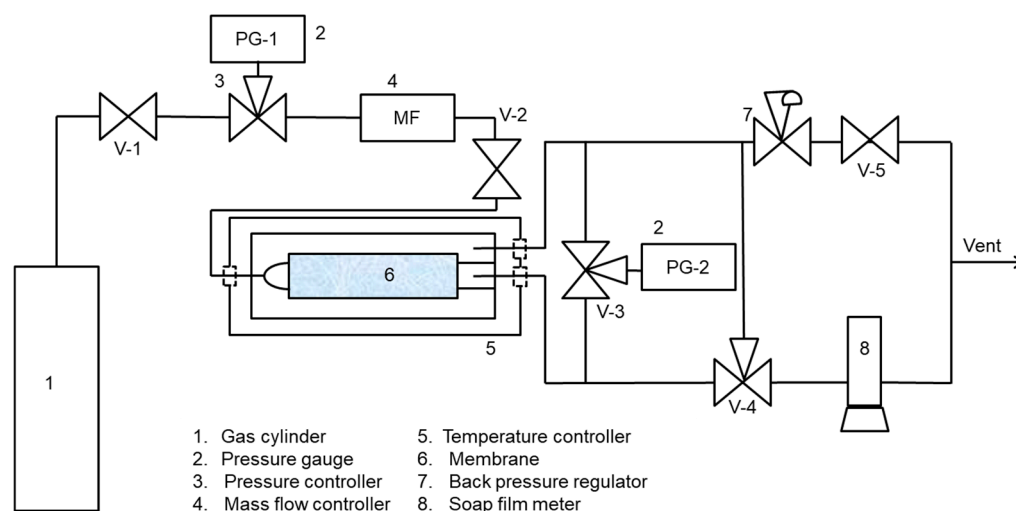
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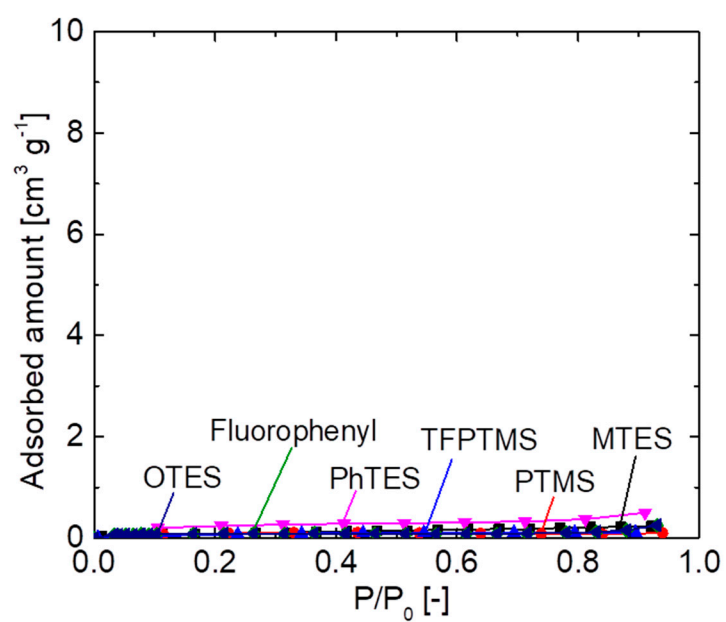
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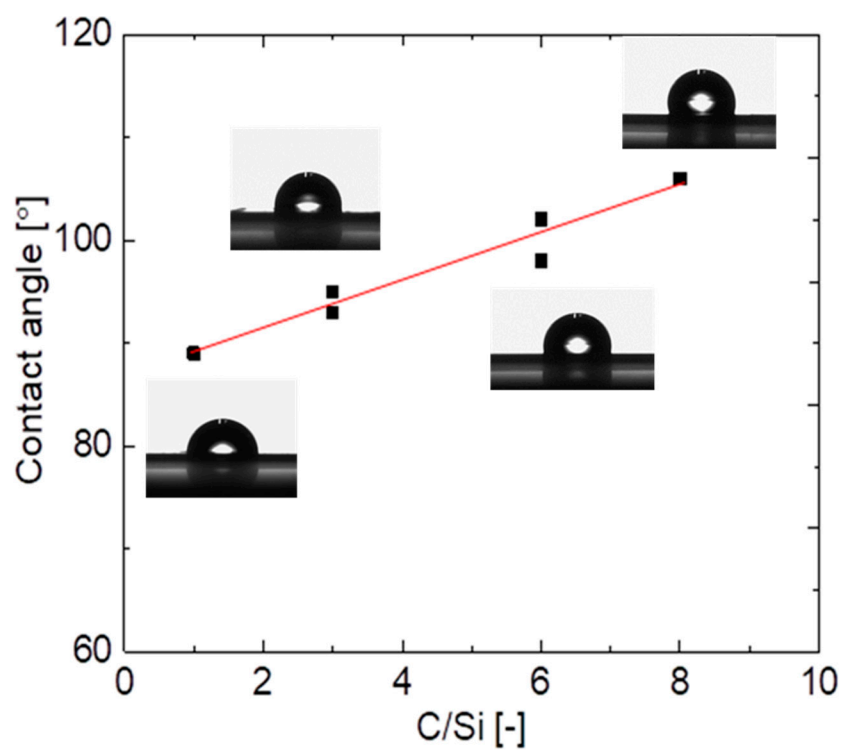
**Figure S1.** Chemical structures of pendent-type organosilica monomers (C<sub>1</sub>–C<sub>8</sub>) utilized to fabricate organosilica membranes.



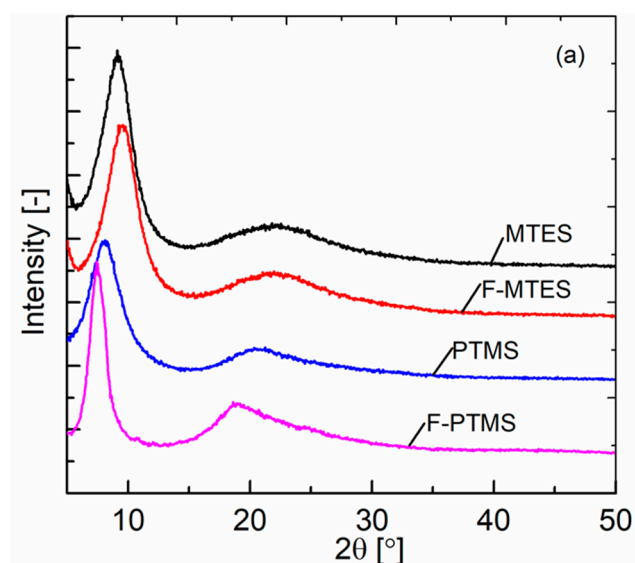
**Figure S2.** Schematic image of the experimental apparatus used for single-gas permeation measurements.



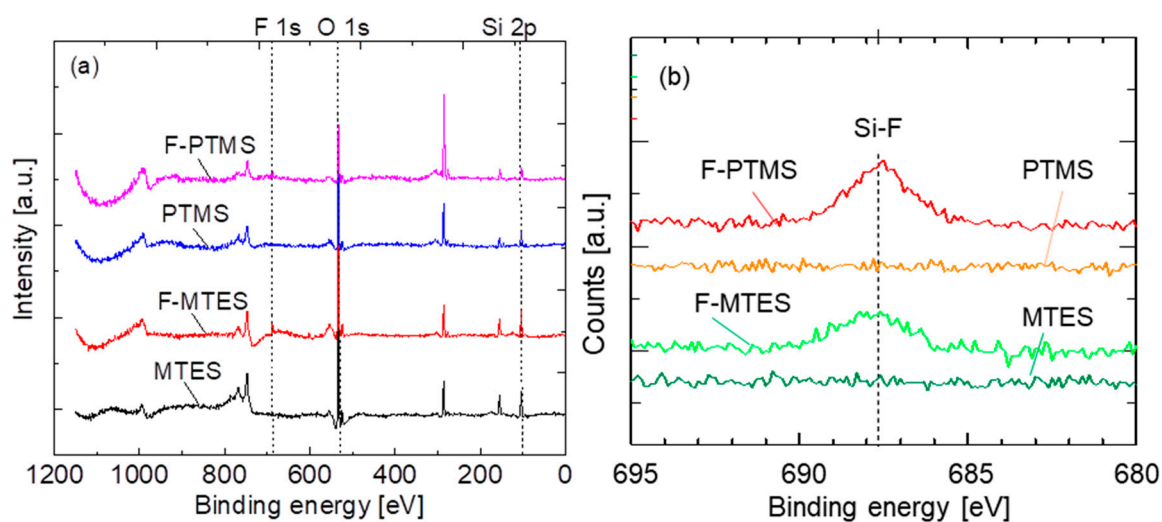
**Figure S3.** N<sub>2</sub> adsorption isotherms at 77 K for various pendant-type organosilica-derived gels calcined at 300 °C under a N<sub>2</sub> atmosphere.



**Figure S4.** Water contact angle of various pendant-type organosilica films calcined at 300 °C under N<sub>2</sub> atmosphere.



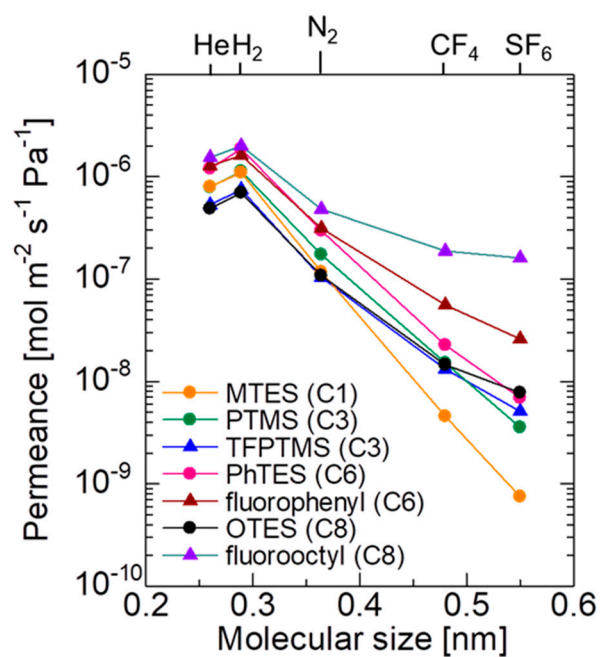
**Figure S5.** XRD pattern of fluorine-doped and undoped pendent-type organosilica gels calcined at 300 °C under N<sub>2</sub> atmosphere.



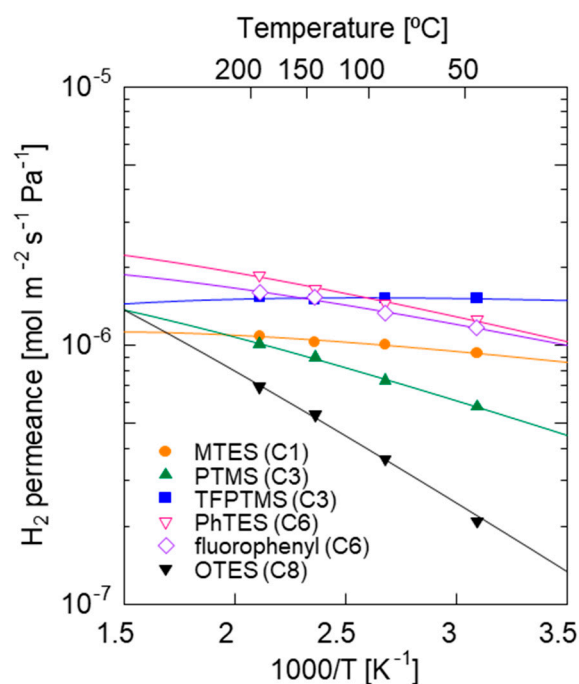
**Figure S6.** XPS spectra in the range of 0–1200 eV (a) and F 1s spectra (b) for fluorine doped and undoped pendent type organosilica gels calcined at 300 °C under N<sub>2</sub> atmosphere.

**Table S1.** Si-OH/Si-O-Si peak area ratio for F-doped/undoped pendent organosilica films calcined at 300 °C under N<sub>2</sub> atmosphere.

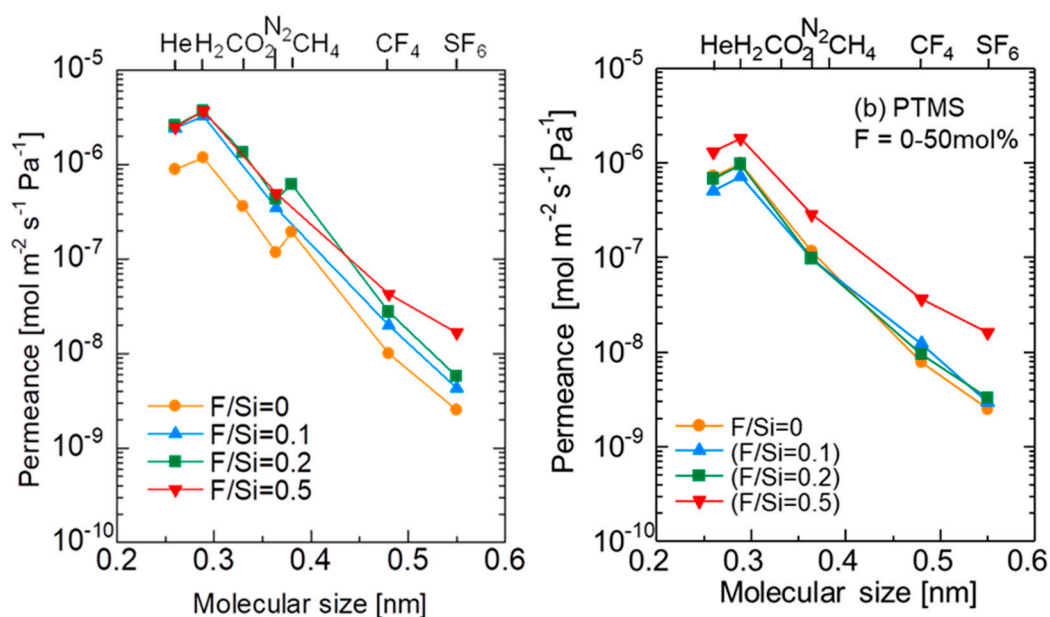
	Before calcination	After calcination
MTES	0.24	0.005
F-MTES	0.19	0.001
PTMS	0.38	0.007
F-PTMS	0.33	0.003



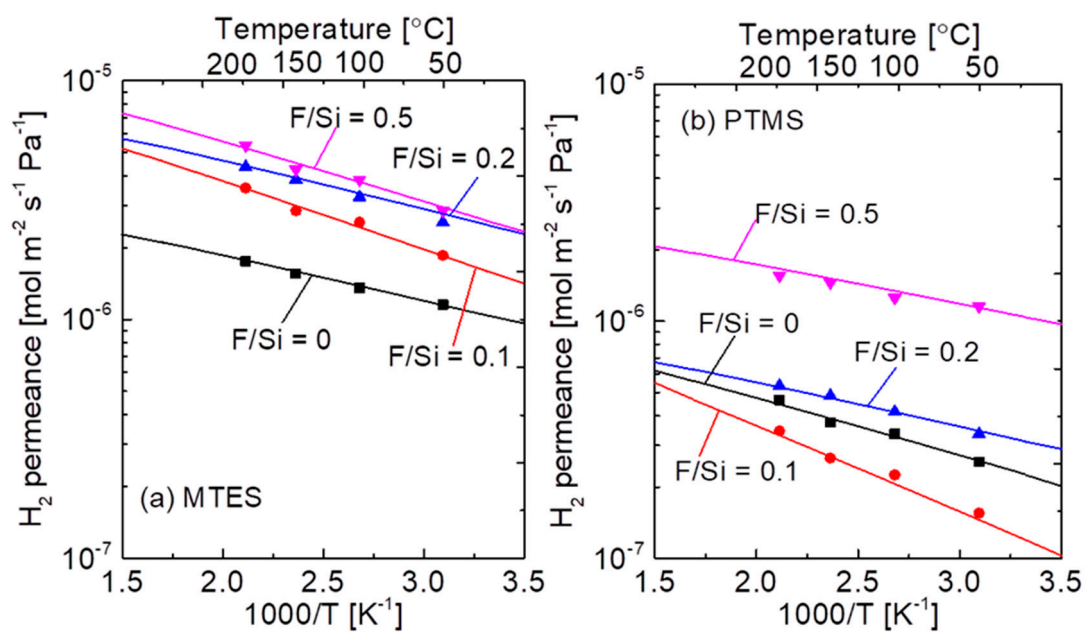
**Figure S7.** Molecular size dependence of pendant-type (C<sub>1</sub>–C<sub>8</sub>) organosilica membranes calcined at 300 °C under a N<sub>2</sub> atmosphere.



**Figure S8.** Temperature dependence of  $H_2$  permeance for pendant-type (C<sub>1</sub>–C<sub>8</sub>) organosilica membranes calcined at 300 °C under a N<sub>2</sub> atmosphere.



**Figure S9.** Molecular size dependence for fluorine-doped and undoped MTES (a) and PTMS (b) pendant-type ( $\text{C}_1\text{--C}_3$ ) organosilica membranes calcined at  $300^\circ\text{C}$  under a  $\text{N}_2$  atmosphere.



**Figure S10.** Temperature dependence of  $\text{H}_2$  permeance for fluorine-doped and undoped MTES (a) and PTMS (b) pendant-type ( $\text{C}_1\text{--C}_3$ ) organosilica membranes calcined at  $300^\circ\text{C}$  under a  $\text{N}_2$  atmosphere.