

Supporting Information for

Highly Hydrophilic Benzenesulfonic Grafted Graphene Oxide Based Hybrid Membrane for Ethanol Dehydration

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Note: The figures, tables and text in this Supporting Information document are presented in the order in which they are referenced in the main paper.

Supporting Figures

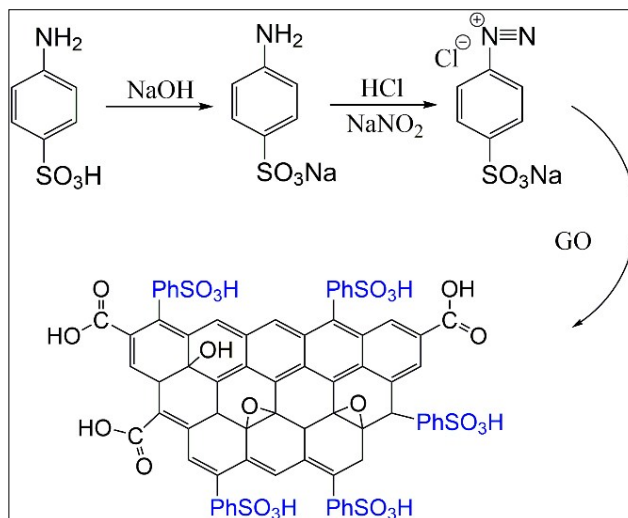


Figure S 1 Reaction scheme for Synthesis of BS@GO.

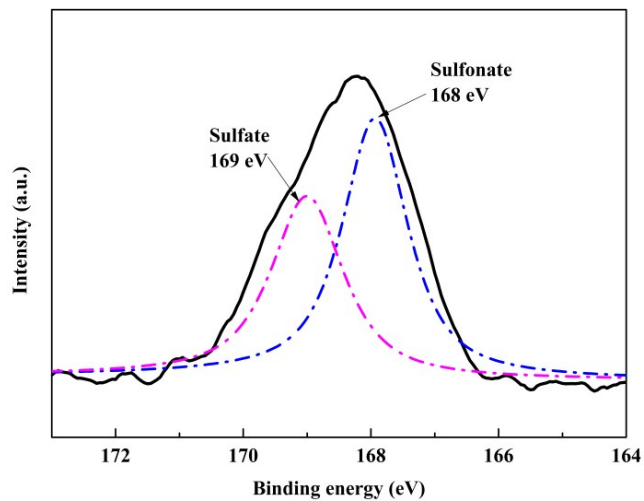


Figure S2 XPS S 2p Scan of BS@GO

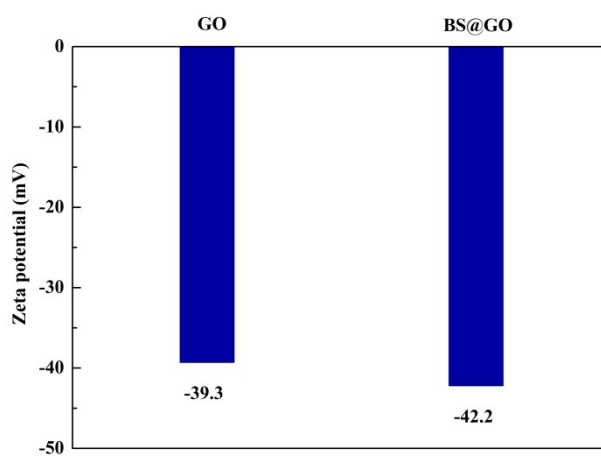


Figure S3 Zeta potentials of GO and BS@GO

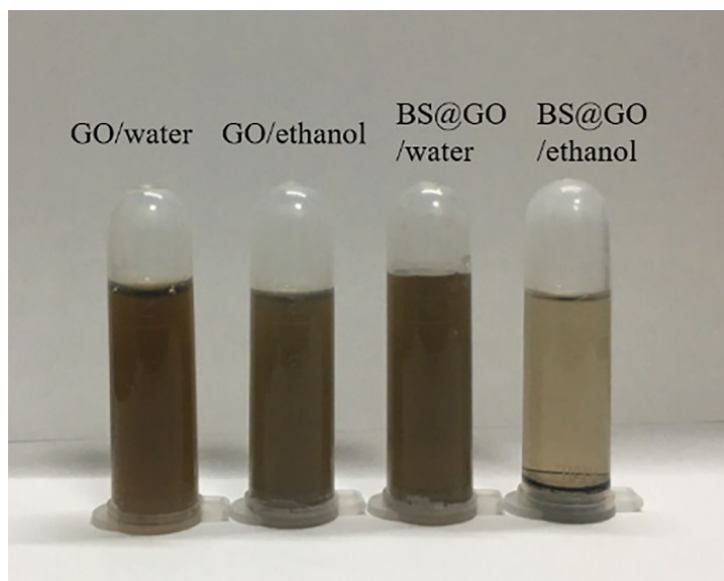


Figure S4 Photographs of GO and BS@GO dispersions with water or ethanol as solvent.

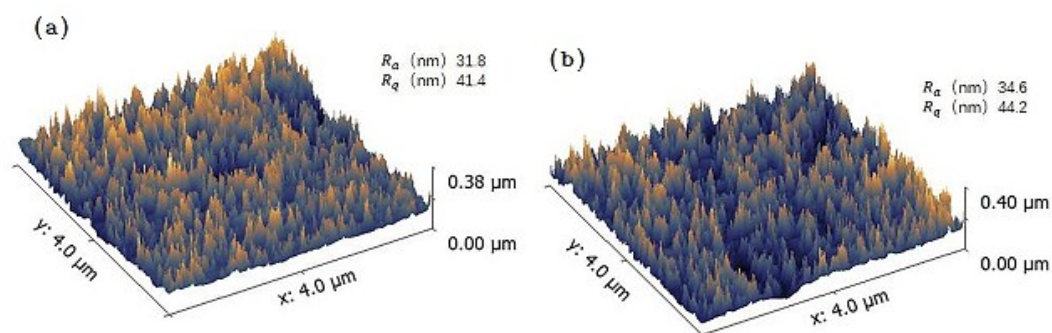


Figure S5 AFM images and roughness data of (a) SA, (b) SA-BS@GO-1.5.

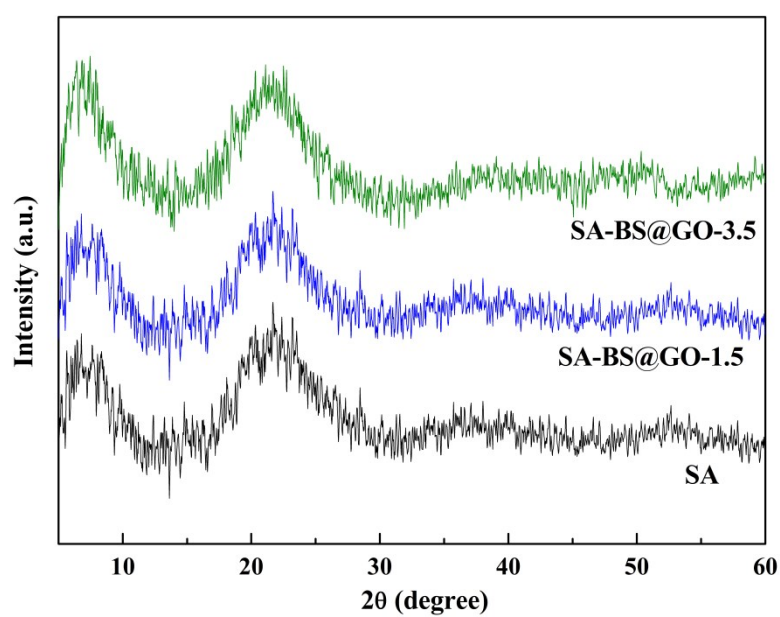


Figure S6 X-ray diffraction curves of SA and SA-BS@GO(X) hybrid membranes.

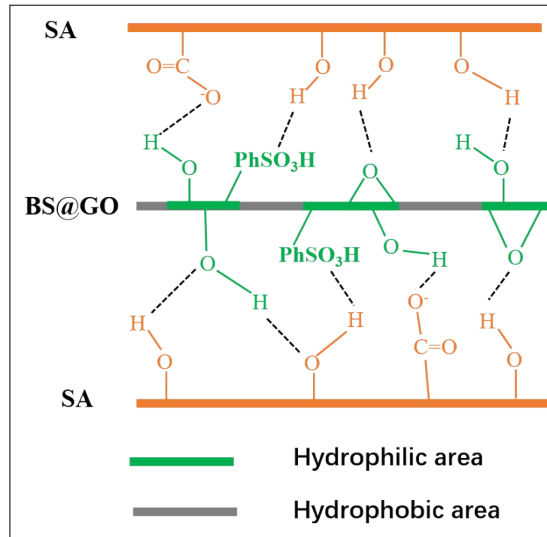


Figure S 7 H-bonds between BS@GO and SA matrix.

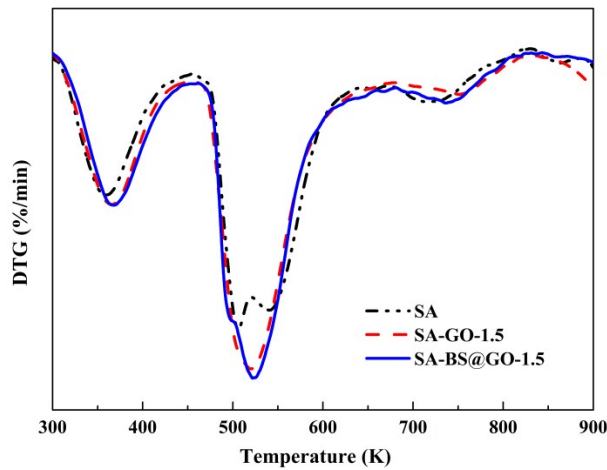


Figure S8 DTG curves of different membrane samples.

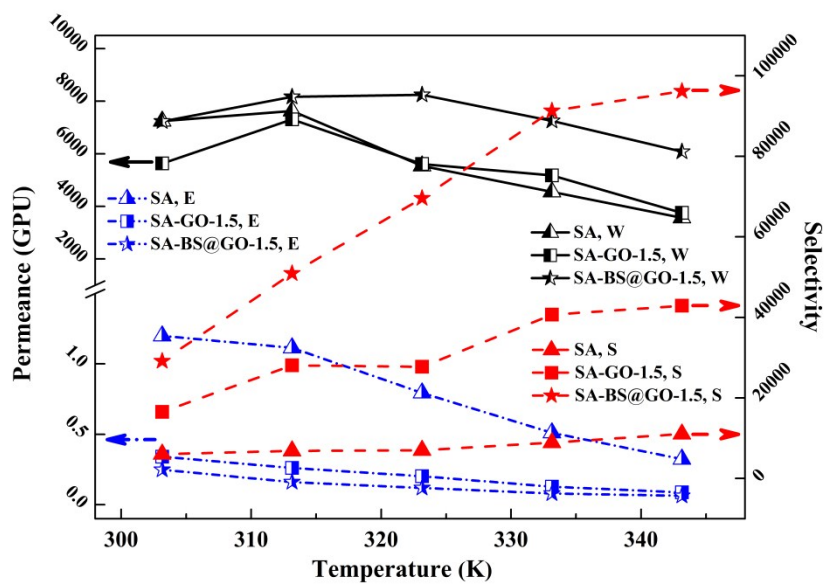


Figure S9 Effects of feed temperature on water permeability, ethanol permeability and selectivity of SA, SA-GO-1.5 and SA-BS@GO-1.5 membranes.

Supporting Tables

Table S1 Thermogravimetric parameters of different membrane samples.

Membrane Sample	1st stage			2nd stage			3rd stage		
	t _{onset} /K	t _{end} /K	% char	t _{onset} /K	t _{end} /K	% char	t _{onset} /K	t _{end} /K	% char
SA	305.2	458.4	11.7	458.4	670.2	35	670.2	833.3	7.2
SA-GO-1.5	304.1	458.4	12.6	458.4	682.4	37.4	682.4	837.8	6.1
SA-BS@GO-1.5	304.1	457.2	12.7	457.2	679.1	38.7	679.1	843.3	6.2

Table S2 A list of ethanol dehydration performance by recently reported membrane.

Type	Membranes	F _w (wt%)	Temperature (°C)	Pervaporation performance		Ref.
				Flux (g m ⁻² h ⁻¹)	α	
SA matrix membranes	SA/ZIF-L	10	77	1218	1840	1
	SA/PSBMA@GO	10	76	2140	1370	2
	SA-HPA	10	30	140	14991	3
	SA-HPA	10	60	315	1000	3
	SA-PTA	10	30	111	1866	4
	SA-PTA	10	60	567	220	4
	SA-PVP-PWA	10	27	100	1250	5
	HA/SA/PAN	10	80	972	1130	6
	SA-PAA@Fe ₃ O ₄ /PAN	10	77	1634	1044	7
SA-4A	2.5	25	106	396	8	
GO-based membranes	GO/GTA	15	60	1020	107	1
	GO/Al ₂ O ₃	10	70	1300	250	9
	GO/PC	25	24	1300	211	10
	CS/FGO	10	30	250	1093	11
	1%IL-GO-PEBA	2.5	60	1828.3	32.5	12
	PVA/GO	10	45	145	3095	13
	SA-rGO/PAN	10	77	1699	566	14
PVA-GOF	10	70	300	330	15	
Other matrix membranes	PVA (Phenyltriethoxysilane)	15	40	145	1026	16
	PVA (Diethoxydiphenylsilane)	15	40	141	248	17
	PVA (Mesoporous silica)	10	60	855	42	17
	PVA/GA/((PEI-GO)/PAA) ₄	5	50	156	981	18
	PVA/modified CNT	10	30	395	662	19
	PVA/TiO-CNT	10	30	388	805	21
PVA/CNT	10	40	82	460	20	

	PVA/CNT	10	40	50	780	21
	PVA	10	60	120	115	22
	PVA (GFT 1510/2510)	5	60	600	258	23
	PVA/ZIF-90	10	30	268	1379	24
	PVA/Fe-DA	10	30	995	2980	25
	PVA/N,N-methylene bisacrylamide	5	40	353	3781	26
	CS-ZIF7	10	25	314b	2885b	27
This work	SA-BS@GO-1.5	10	50	461	4969	Long-term
	SA-BS@GO-1.5	10	70	703	5480	optimum

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