

## Sustainable Glycerol Carbonate Electrolytes for Li-ion Supercapacitors: Performance Evaluation of Butyl, Benzyl, and Ethyl Glycerol Carbonates

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Figure S1: Thermal Gravimetric Analysis (TGA) of 3-Ethoxy-1,2-propylene carbonate (Ethyl GlyC).

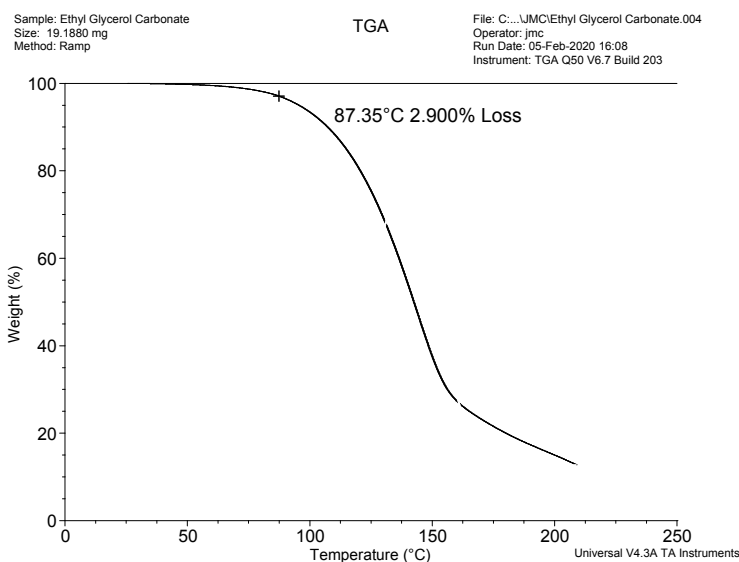


Figure S2: Thermal Gravimetric Analysis (TGA) of 3-benzyloxy-1,2-propylene carbonate (Benzyl GlyCs).

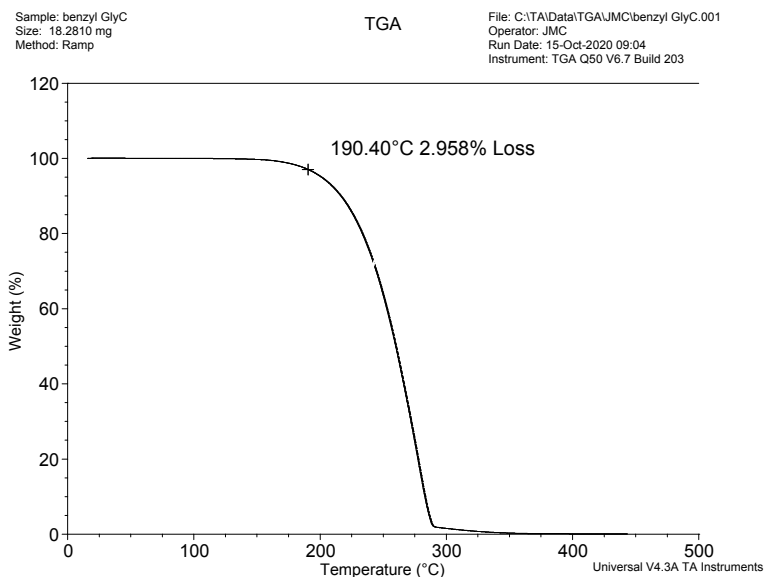


Figure S3: Thermal Gravimetric Analysis (TGA) of 3-Butoxy-1,2-propylene carbonate (Butyl GlyCs).

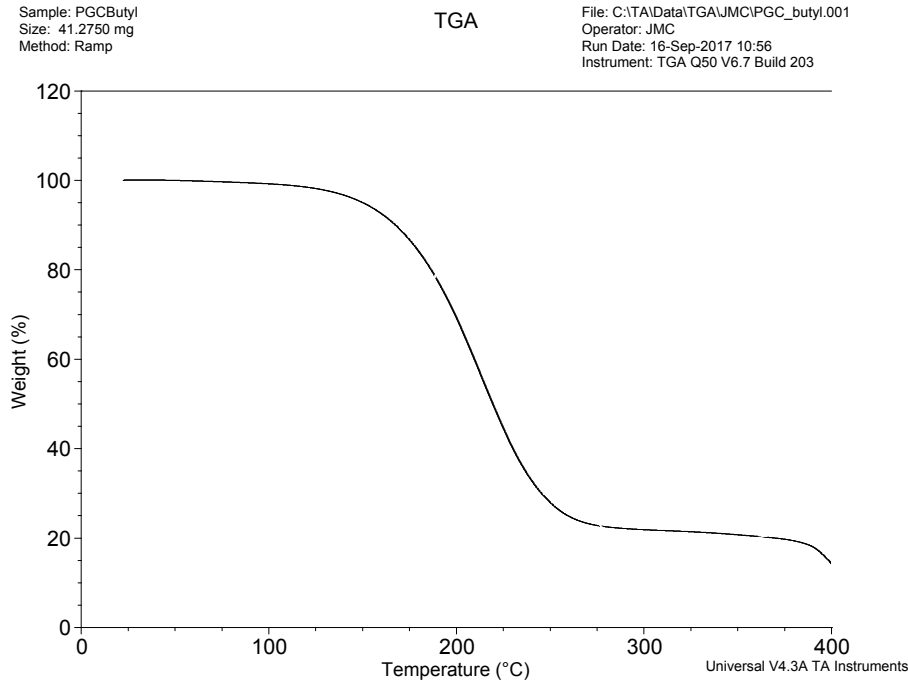


Figure S4: Complex viscosity versus temperature of the three glycerol carbonates from 20 °C to 100 °C.

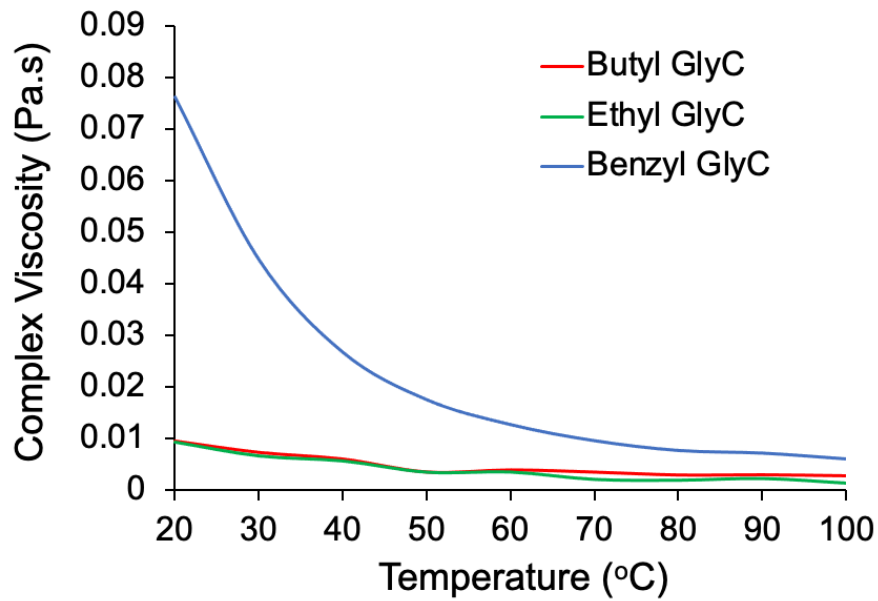


Table 1: Comparison of AC based Supercapacitors in Literatures

Electrode	Electrolyte	Discharge capacitance	Temperature (°C)	Cycle No.	Publication
AC	1.6 M Tetraethylammonium tetrafluoroborate in ACN	26	Room	Not listed	Ref. 23  DOI:10.1039/C9TA00154A
Activated carbon, carbon black, and PvdF binder	N-methyl-N-methoxymethyl-piperidinium-bis(trifluoromethylsulfonyl)imide with 1.0 M LiTFSI	36 F/g	100 °C	+ 10,000	Ref. 6 DOI: 10.1039/C8CC01093E
CECA Acticarbone AB activated carbon (microporous) and PTFE binder	1-Butyl-1-methylpyrrolidinium bis(trifluoromethylsulfonyl)imide	90 F/g	60 °C	40 000	Ref. 5 DOI: 10.1016/j.jpowsour.2006.12.048
Lignin: PVA carbon fiber mats	1-Butyl-1-methylpyrrolidinium bis(trifluoromethylsulfonyl)imide: PC:EC system	72 F/g	Room	+1000	Ref. 32 DOI: 10.1088/1361-6528/aafe95
Activated carbon, carbon black, and carboxymethyl cellulose salt binder	1-Butyl-1-methylpyrrolidinium bis(trifluoromethylsulfonyl)imide	145 F/g	80 °C	Not listed	Ref. 9 DOI: 10.1039/c2ra20177a
Graphene Nanosheets	1-Allyl-3-methylimidazolium -{OTf; TFA; BF4 or PF6, TFSI, DCA}	52- 30 F/g 0.5 A/g	Room	Not listed	Ref. 29 DOI: 10.1016/j.molliq.2017.11.078
Activated carbon	(Tributyl-phosphine tetrafluoroborate) with ACN (X <sub>ACN</sub> =0.86)	120 F/g	50 C	1000	Ref. 34 DOI: <a href="https://doi.org/10.1016/j.elecom.2017.07.010">https://doi.org/10.1016/j.elecom.2017.07.010</a>
Activated carbon	4.09 M 1-Ethyl-3-methylimidazolium tetrafluoroborate /ACN	32 F/g	Room	+2000	Ref. 33 DOI: <a href="https://doi.org/10.1016/j.colsurfa.2020.124858">https://doi.org/10.1016/j.colsurfa.2020.124858</a>
Onion-like carbon, free of microporous	1-Ethyl-3-methylimidazolium bis(trifluoromethylsulfonyl)imide: tetrafluoroborate (80:20)	~25 F/g	room	10,000 *elevated voltage	Ref. 27 DOI: 10.1002/anie.201412257
Activated carbon from furfuraldehyde	1-methyl-3-butyl-imidazolium tetrafluoroborate	111 F/g	room	Not listed	Ref. 28 DOI: 10.1016/j.electacta.2010.03.065
Activated carbon	1-propyl-1-methylpyrrolidinium bis(trifluoromethylsulfonyl)imide	175 F/g	80 °C	Not listed	Ref. 26 DOI: 10.1016/j.elecom.2011.07.010

	gel				
D-glucose derived activated carbon powder	5 wt% (1-Ethyl-3-methylimidazolium iodide) in 1-Ethyl-3-methylimidazolium Tetrafluoroborate	~245 F/g	room	2500	Ref. 31 DOI: 10.1149/2.014403jes
Waste watermelon rinds	1-Ethyl-3-methylimidazolium - bis(trifluoromethylsulfonyl)imide	320 F/g	60 °C	10,000, lose 48% of discharge capacity	Ref. 25 DOI: 10.1016/j.jpowsour.2018.02.037
Activated carbon	1-methyl-1-propylpiperidinium trifluoromethanesulfonate, 1-methyl-1-propylpiperidinium bis(trifluoromethylsulfonyl)imide and 1-ethyl-3-methylimidazolium bis(trifluoro-methylsulfonyl)imide with ACN	100-170 F/g	60 °C	10,000	Ref. 24 DOI: 10.1016/j.jpowsour.2016.05.008
KOH-activated microwave exfoliated graphite oxide ('a-MEGO') electrodes	1:1 (w/w) N-methyl-N-propylpiperidinium bis(fluorosulfonyl)imide: N-butyl-N-methylpyrrolidinium bis(fluorosulfonyl)-imide	130 F/g	Room, various temps.	Not listed	Ref. 30 DOI: 10.1016/j.nanoen.2012.11.006