Supplemental Section - Direct measurement of the chemical reactivity of silicon electrodes with battery electrolytes

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Materials Synthesis

Thin films were deposited by magnetron sputtering from commercially available 2" diam. Targets, Cr (99.95% - Kurt J. Lesker) and Si (99.99% - Kurt J. Lesker) in an in-house sputtering system. Base pressures were below 6 x 10^{-7} torr before deposition and the target to substrate distances were 7.2 cm. Rates were measured using a quartz crystal microbalance. The Cr films were deposited by DC sputtering at an applied power of 40W, at 7.5 mtorr Ar (99.9995%, Air Liquide) for 2 minutes. The Si films were deposited by rf magnetron sputtering at an applied power of 80W at 7.5 mtorr Ar for 5 minutes. 2" diameter silicon substrates were obtained from the Institute of Electronic Materials Technology, Warszawa, Poland. Witness samples were grown simultaneous as films made for the NR by placing a piece of Si on the sides of the primary NR sample.

The 1.2M $LiPF_6$-3:7 wt% ethylene carbonate (EC):dimethyl carbonate (DMC) electrolyte was obtained from BASF. Prior to the experiment all the bottles used were dried at 100^{o}C for 2 days to remove water. Water content was estimated by Karl-Fisher Titration (Metler-Toledo). Anydrous DMC (Aldrich) and deuterated cyclohexane (Cambridge Isotopes) were dried over molecular sieves for several weeks before use.

Characterization

X-ray photoelectron spectroscopy was obtained using a PHI 3056 spectrometer with an Al anode source operated at 15 kV and an applied power of 350 W. High resolution spectroscopy data were collected using a 23.5 eV pass energy; lower resolution survey scans were collected at a pass energy of 93.5 eV. The primary C1s peak was fixed at 284.8 eV, however there was no

evidence of sample charging. A Hitachi S4800 SEM, operating at 10kV in back-scattered SEM imaging mode, was used to examine the defects in the thin films.

Photoacoustic FTIR spectrum was recorded using a BioRad FTS-575c spectrometer with a KBr beamsplitter equipped with a MTEC 300 PAS Cell. Helium was used as the carrier gas and the mirror velocity was 5 kHz. A carbon black reference spectrum was used to linearize the Si thinfilm sample. The real and imaginary parts of the PA spectra were extracted from symmetric interferograms of the carbon black reference and Si thin film. The PAS linearized spectrum was then calculated by:

I[linear] = (Re(I[Si])^2 + Im(I[Si])^2) / (Re(I[Si]) * Im(I[Ref]) - Im(I[Si]) * Re(I[Ref]))
Linearization has an increased effect upon the surface bands since the phase for surface species is close to 45°. (R. O. Carter, Appl. Spectrosc. 46, 1992, 219-224).

Neutron reflectometry (NR) was used to determine the formation of a reaction layer at the α-Si, electrolyte interface. The reflectivity, R (Q), defined as the ratio of the neutrons reflected to the number of neutrons incident, was measured as a function of the perpendicular wave vector transfer, $Q = (4\pi/\lambda) \sin\theta$, where λ is the neutron wavelength and θ the incident angle between the neutron beam and the sample surface (see ref 16 for a detailed description of NR). The NR measurements were performed on the Liquids Reflectometer (LR) at the Spallation Neutron Source (SNS), located at Oak Ridge National Laboratory. The LR uses the time-of-flight technique and is positioned on beam line 4B (BL-4B) viewing a coupled supercritical hydrogen moderator producing useful neutrons from 2.5 Å to 17.5 Å. Neutrons with a bandwidth of 3.5 Å are selected from this range using three-bandwidth choppers positioned in a serial fashion on a curved and tapered guide. For these measurements seven wavelength bands centered at 14.40 Å ($\theta = 0.6^o$), 12.74 Å ($\theta = 0.6^o$), 10.58 Å ($\theta = 0.6^o$), 8.40 Å ($\theta = 0.6^o$), 6.17 Å ($\theta = 0.6^o$), 3.89 Å ($\theta = 0.6^o$), and 3.75 Å ($\theta = 1.12^o$) were selected. From these instrument settings, we acquired reflectivity data covering a wide perpendicular momentum transfer (Q) range of $0.007 < Q < 0.16$ Å^{-1}. Analysis of the reduced reflectivity profiles was carried out using the genetic algorithm provided in the neutron and x-ray reflectivity analysis package Motofit. Details can be found at [Nelson].

[Nelson] A. Nelson. Co-refinement of multiple contrast neutron / x-ray reflectivity data using MOTOFIT. Journal of Applied Crystallography, 39:273–276, 2006.

Table S1. Refined values from fits to the NR data.

As-Prepared			
	Thickness (Å)	SLD (x10^{-6} Å^{-2})	Roughness (Å)
Surface	22.70 (0.50)	1.733 (0.018)	8.86 (0.75)
a-Si	765.32 (0.51)	1.989 (0.007)	20.13 (4.68)
Cr	467.42 (0.66)	3.014 (0.003)	71.60 (1.79)
SiO_x	21.76 (0.52)	3.424 (0.014)	4.82 (0.09)
After Electrolyte Exposure			
	Thickness (Å)	SLD (x10^{-6} Å^{-2})	Roughness (Å)
Surface	35.31 (0.33)	3.847 (0.027)	9.71 (1.03)
a-Si	747.19 (0.99)	2.318 (0.018)	22.96 (5.78)
Cr	469.29 (1.17)	3.028 (0.022)	72.36 (4.18)
SiO_x	21.76 (--)	3.424 (--)	4.82 (0.09)

S1. XPS data collected for the as-deposited Si electrode exposed to air. Elemental analysis data, from the XPS data indicate a surface composition of 45.5 at% Si, 40 at% O, 14.5 at% C.

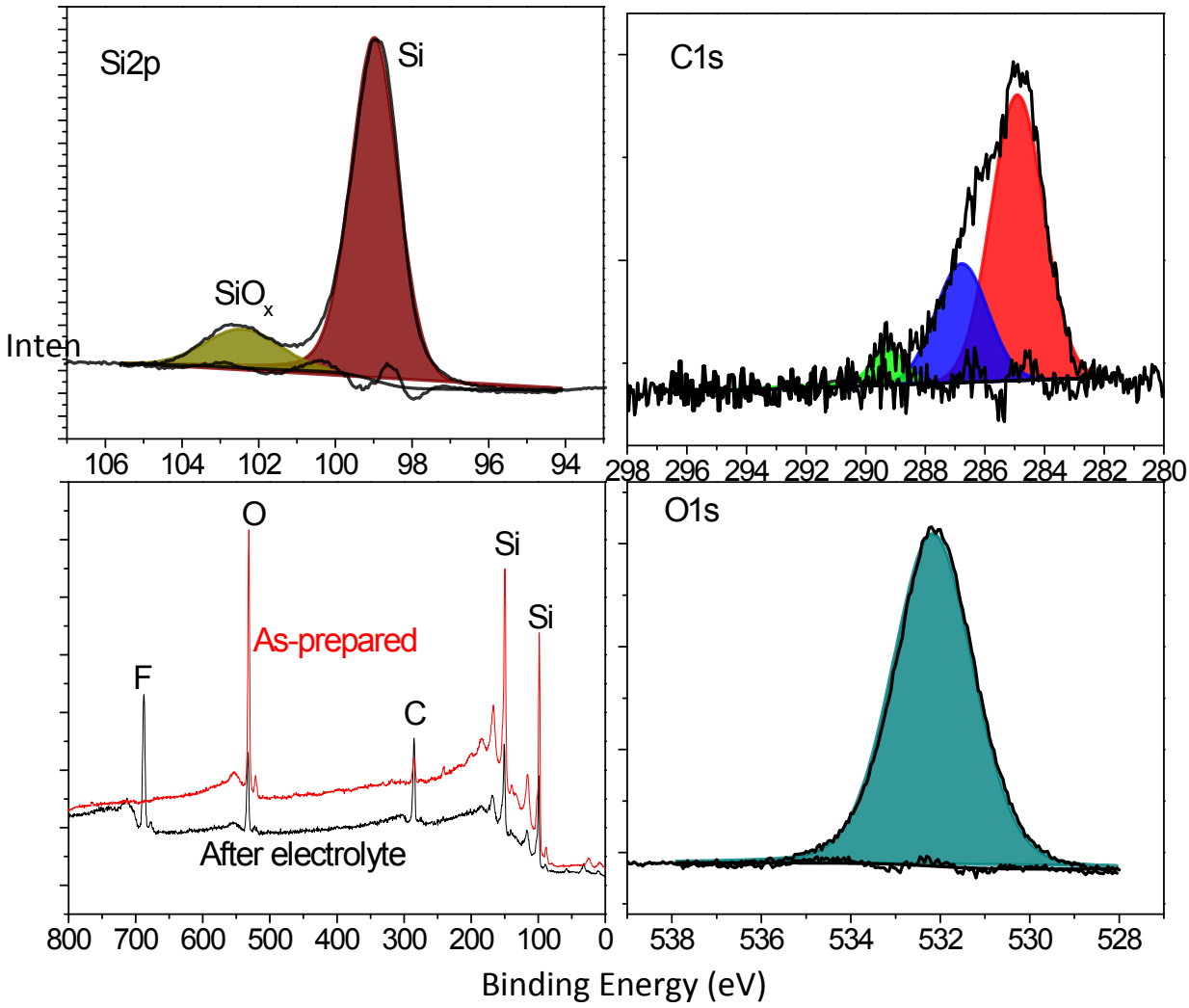


Figure S2. Comparison of Si2p XPS data collected for the Si substrate and the Si film deposited on the Cr coated substrate. The data shows significantly higher SiO_x species on the substrate than the film.

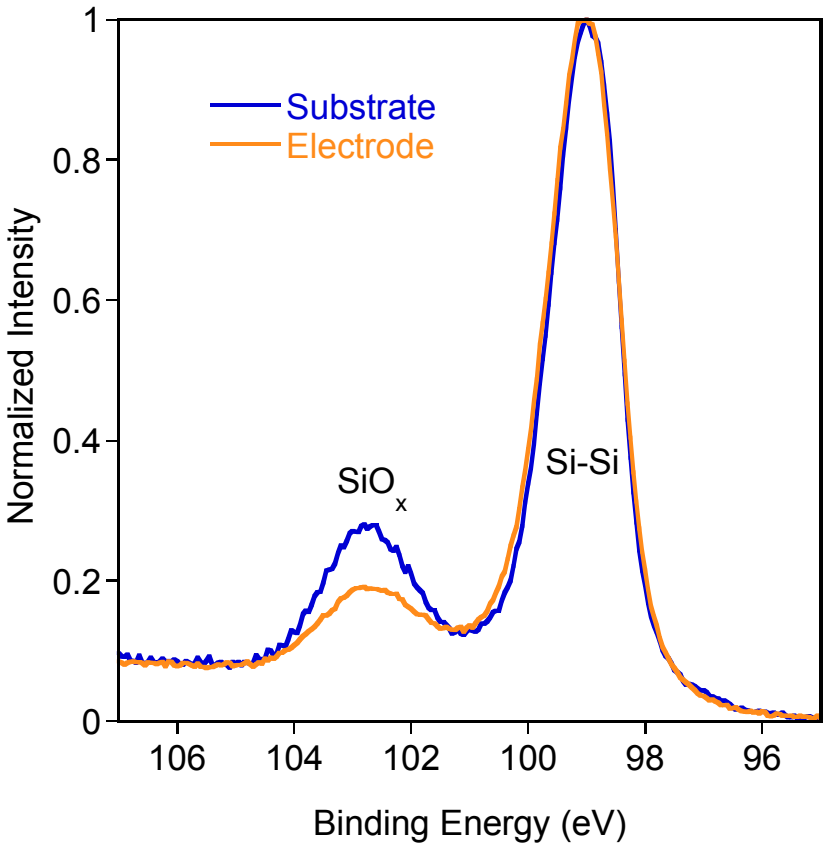
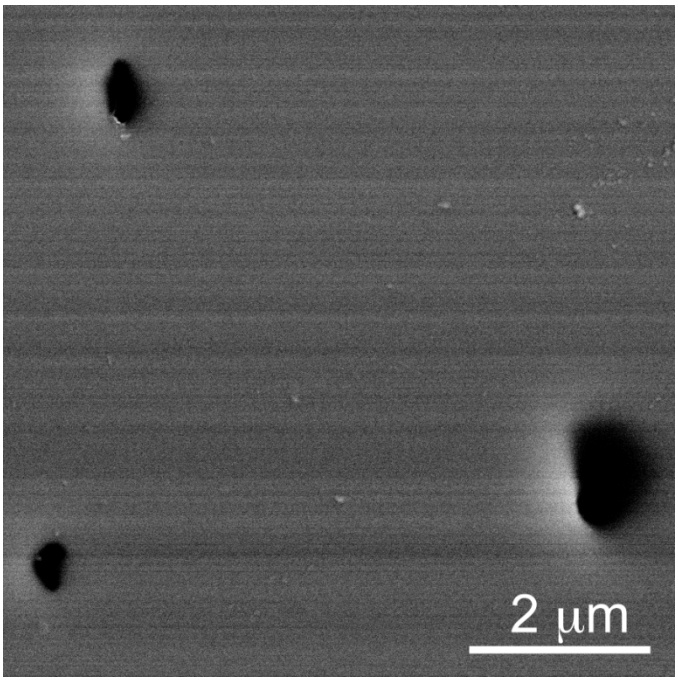


Figure S3. SEM image of Si electrode reacted for 5 d in the electrolyte and washed with DMC.



a-Si in air

Q	R	dR	dQ	
0.00908348	1.00568	0.204062	0.00058167	
0.00917432	1.00852	0.199713	0.000583486	
0.00926606	1.00595	0.1528	0.000585321	
0.00935872	1.0465	0.127145	0.000587174	
0.00945231	1.03206	0.108791	0.000589046	
0.00954683	1.08877	0.117124	0.000590937	
0.0096423	1.01136	0.0845984	0.000592846	
0.00973872	1.0028	0.0958268	0.000594774	
0.00983611	1.02929	0.0977634	0.000596722	
0.00993447	0.99744	0.0760171	0.000598689	
0.0100338	1.00869	0.0830852	0.000600676	
0.0101342	0.989317	0.0737894	0.000602683	
0.0102355	0.962041	0.0628102	0.00060471	
0.0103379	1.00888	0.0660272	0.000606757	
0.0104412	0.875322	0.0594659	0.000608825	
0.0105456	0.9095	0.0569517	0.000610913	
0.0106511	0.702752	0.0471467	0.000613022	
0.0107576	0.790559	0.0490371	0.000615152	
0.0108652	0.637669	0.0412261	0.000617304	
0.0109738	0.578812	0.0382311	0.000619477	
0.0110836	0.525581	0.0342029	0.000621672	
0.0111944	0.385998	0.0284683	0.000623888	
0.0113064	0.368839	0.026231	0.000626127	
0.0115336	0.405377	0.0427356	0.000630672	
0.0116489	0.413075	0.037713	0.000632979	
0.0117654	0.458502	0.0385765	0.000635309	
0.0121219	0.428957	0.0338113	0.000642439	
0.0122432	0.445171	0.0327861	0.000644863	
0.0124893	0.441156	0.0306319	0.000649785	
0.0126141	0.371076	0.0254401	0.000652283	
0.0127403	0.395615	0.0261075	0.000654806	
0.0128677	0.405585	0.0229623	0.000657354	
0.0129964	0.34004	0.0228647	0.000659927	
0.0131263	0.368865	0.0207435	0.000662527	
0.0132576	0.300845	0.0181639	0.000665152	
0.0133902	0.303311	0.0174756	0.000667803	
0.0136593	0.242105	0.0153796	0.000673186	
0.0137959	0.186811	0.0127299	0.000675918	
0.0139339	0.181083	0.0124585	0.000678677	
0.0140732	0.129844	0.010217	0.000681464	
0.0142139	0.10916	0.00908381	0.000684279	
0.0143561	0.0726989	0.00709044	0.000687121	
0.0144996	0.0454721	0.00563662	0.000689993	
0.0146446	0.0345398	0.00490812	0.000692893	
0.0147911	0.0233395	0.00381714	0.000695822	
0.014939	0.0206746	0.00366263	0.00069878	
0.0152393	0.0156722	0.003002	0.000704785	
0.0153917	0.0155484	0.00288434	0.000707833	
0.0155456	0.0194827	0.00315277	0.000710911	

0.015701 0.0213103 0.00318535 0.00071402
0.015858 0.0218901 0.00316455 0.000717161
0.0160166 0.0245696 0.0032533 0.000720332
0.0161768 0.0269809 0.00164342 0.000723536
0.0163385 0.0228409 0.00134685 0.000726771
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0.0180479 0.00840873 0.00062954 0.000760958
0.0182284 0.00935088 0.00068312 0.000764568
0.0184107 0.0081349 0.00060465 0.000768214
0.0185948 0.0089388 0.000612516   0.000771896
0.0187807 0.0113232 0.00069774 0.000775615
0.0189685 0.0112182 0.00066419 0.000779371
0.0191582 0.012376   0.000689883   0.000783165
0.0193498 0.0126771 0.000685487   0.000786996
0.0195433 0.0139598 0.000709349   0.000790866
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0.108212 3.77836e-06 9.89082e-07 0.00256424
0.109294 3.62358e-06 9.19921e-07 0.00258588
0.110387 6.06895e-06 1.07173e-06 0.00260774
0.111491 4.53415e-06 9.09359e-07 0.00262981
0.112606 4.81876e-06 9.28824e-07 0.00265211
0.113732 3.19628e-06 8.12199e-07 0.00267463
0.114869 3.36732e-06 9.01247e-07 0.00269738
0.116018 3.14185e-06 8.7626e-07 0.00272035
0.117178 2.1365e-06 8.05793e-07 0.00274356
0.11835 2.76947e-06 8.28803e-07 0.00276699
0.119533 4.82164e-06 9.54128e-07 0.00279066
0.120728 3.69549e-06 8.73829e-07 0.00281457
0.121936 2.63776e-06 7.59423e-07 0.00283871
0.123155 1.04842e-06 6.1839e-07 0.0028631
0.124387 3.52171e-06 8.96338e-07 0.00288773
0.125631 3.65612e-06 8.7813e-07 0.00291261
0.126887 2.62401e-06 8.28839e-07 0.00293774
0.128156 1.2054e-06 6.49328e-07 0.00296311

0.129437	2.24728e-06	7.08767e-07	0.00298874
0.130732	1.57344e-06	6.57268e-07	0.00301463
0.132039	2.6883e-06	3.97768e-07	0.00304078
0.133359	1.66753e-06	3.45635e-07	0.00306719
0.134693	1.29425e-06	3.58764e-07	0.00309386
0.13604	1.69443e-06	3.72488e-07	0.0031208
0.1374	1.65963e-06	3.5752e-07	0.003148
0.138774	2.34826e-06	3.88009e-07	0.00317548
0.140162	1.60366e-06	3.25038e-07	0.00320324
0.141564	1.70752e-06	3.42989e-07	0.00323127
0.142979	8.83928e-07	2.91672e-07	0.00325958
0.144409	2.27326e-06	3.35319e-07	0.00328818
0.145853	1.21854e-06	2.9388e-07	0.00331706
0.147312	1.10269e-06	3.01657e-07	0.00334623
0.148785	1.68856e-06	3.04029e-07	0.0033757
0.150273	1.38886e-06	2.93336e-07	0.00340545
0.151775	1.60081e-06	2.86768e-07	0.00343551
0.153293	1.50212e-06	2.82512e-07	0.00346586
0.154826	1.86017e-06	2.96417e-07	0.00349652
0.156374	9.49279e-07	2.51797e-07	0.00352749
0.157938	5.61537e-07	2.31359e-07	0.00355876
0.159517	1.15766e-06	2.63955e-07	0.00359035
0.161113	9.67404e-07	2.92076e-07	0.00362225
0.162724	6.68442e-07	2.78186e-07	0.00365447
0.164351	9.93424e-07	2.74355e-07	0.00368702

a-Si in d_cyclohexane after 5d

Q	R	dR	dQ	
0.00790229	1	0.000857665		0.000558046
0.00798132	1.02007	0.0171533		0.000559626
0.00806113	1.02614	0.102335		0.000561223
0.00814174	0.999371	0.103889		0.000562835
0.00822316	1.01999	0.111154		0.000564463
0.00830539	1.04241	0.0955102		0.000566108
0.00838844	1.02678	0.0828684		0.000567769
0.00847233	1.01085	0.0922888		0.000569447
0.00855705	1.0162	0.08839		0.000571141
0.00864262	1.01315	0.0816205		0.000572852
0.00872905	0.999965	0.0769338		0.000574581
0.00881634	0.999155	0.0759194		0.000576327
0.0089045	0.999049	0.0726034		0.00057809
0.00899355	1.05765	0.0737646		0.000579871
0.00908348	1.01001	0.0622881		0.00058167
0.00917432	1.01352	0.0557785		0.000583486
0.00926606	1.00475	0.0526877		0.000585321
0.00935872	1.02748	0.0556516		0.000587174
0.00945231	0.999955	0.0505425		0.000589046
0.00954683	1.015	0.0529074		0.000590937
0.0096423	1.03769	0.0501762		0.000592846
0.00973872	0.997504	0.0468849		0.000594774
0.00983611	0.992239	0.0453408		0.000596722
0.00993447	1.07766	0.0868911		0.000598689
0.0100338	0.99938	0.0810203		0.000600676
0.0101342	1.04552	0.0822641		0.000602683
0.0102355	1.08859	0.0790428		0.00060471
0.0103379	1.09938	0.0787458		0.000606757
0.0104412	0.999722	0.0716517		0.000608825
0.0105456	0.997904	0.0600245		0.000610913
0.0106511	0.998857	0.057576		0.000613022
0.0107576	0.998683	0.0566531		0.000615152
0.0108652	0.995903	0.0546435		0.000617304
0.0109738	0.99235	0.0524273		0.000619477
0.0110836	1.07743	0.0532723		0.000621672
0.0111944	1.02833	0.0543528		0.000623888
0.0113064	0.995563	0.0485428		0.000626127
0.0114194	1.01861	0.0955596		0.000628388
0.0115336	1.00928	0.0998581		0.000630672
0.0116489	1.02563	0.100124		0.000632979
0.0117654	1.01248	0.0931289		0.000635309
0.0118831	1.04268	0.0862722		0.000637662
0.0120019	1.07046	0.085739		0.000640038
0.0121219	1.0581	0.0834632		0.000642439
0.0122432	1.05327	0.0814215		0.000644863
0.0123656	1.01096	0.0775317		0.000647312
0.0124893	1.01933	0.0764688		0.000649785
0.0126141	1.0244	0.0737609		0.000652283
0.0127403	1.02449	0.0743737		0.000654806

0.0128677	1.01118	0.0582098	0.000657354
0.0129964	1.0153	0.0549823	0.000659927
0.0131263	1.0494	0.0530166	0.000662527
0.0132576	1.03594	0.0518513	0.000665152
0.0133902	1.0345	0.050811	0.000667803
0.0135241	1.02833	0.0488407	0.000670481
0.0136593	1.00153	0.0478144	0.000673186
0.0137959	0.936975	0.0428589	0.000675918
0.0139339	0.97241	0.0431037	0.000678677
0.0140732	0.970045	0.0657857	0.000681464
0.0142139	0.995226	0.0673009	0.000684279
0.0143561	0.851596	0.0576003	0.000687121
0.0144996	0.900807	0.0591589	0.000689993
0.0146446	0.839751	0.0545102	0.000692893
0.0147911	0.743355	0.0509998	0.000695822
0.014939	0.645274	0.0457095	0.00069878
0.0150884	0.435507	0.0358987	0.000701768
0.0152393	0.379216	0.0330047	0.000704785
0.0153917	0.339274	0.029891	0.000707833
0.0155456	0.291652	0.0271225	0.000710911
0.015701	0.263642	0.0240571	0.00071402
0.015858	0.203374	0.02113	0.000717161
0.0160166	0.214008	0.0210643	0.000720332
0.0161768	0.179833	0.0193343	0.000723536
0.0163385	0.128883	0.00876581	0.000726771
0.0165019	0.12748	0.00871788	0.000730039
0.016667	0.108897	0.00767741	0.000733339
0.0168336	0.106042	0.00733146	0.000736672
0.017002	0.0857735	0.00646496	0.000740039
0.017172	0.0743584	0.00593845	0.00074344
0.0173437	0.0627773	0.00531535	0.000746874
0.0175171	0.0491344	0.00467018	0.000750343
0.0176923	0.0444979	0.00411729	0.000753846
0.0178692	0.0442762	0.00411953	0.000757385
0.0180479	0.0467033	0.00418545	0.000760958
0.0182284	0.0431771	0.00377953	0.000764568
0.0185948	0.0508472	0.00508595	0.000771896
0.0187807	0.0513067	0.00481102	0.000775615
0.0189685	0.0454476	0.004323	0.000779371
0.0191582	0.049597	0.00454905	0.000783165
0.0193498	0.0524369	0.00463026	0.000786996
0.0195433	0.0471078	0.00420981	0.000790866
0.0197387	0.0437673	0.00393399	0.000794775
0.0199361	0.0491294	0.00415363	0.000798723
0.0201355	0.0490255	0.00408704	0.00080271
0.0203369	0.0432785	0.00377636	0.000806737
0.0205402	0.0433903	0.00352275	0.000810804
0.0207456	0.0423701	0.00352005	0.000814912
0.0209531	0.035816	0.00317269	0.000819062
0.0211626	0.0281594	0.00274631	0.000823252
0.0213742	0.0322383	0.00290109	0.000827485
0.021588	0.0271247	0.00260259	0.00083176

0.0218039 0.021832   0.00229189 0.000836077
0.0220219 0.0141003 0.00178156 0.000840438
0.0222421 0.0135766 0.0017406 0.000844842
0.0224645 0.0124219 0.000648787   0.000849291
0.0226892 0.0105694 0.000580274   0.000853784
0.0229161 0.00948746 0.000528756   0.000858321
0.0231452 0.0080201 0.000481625   0.000862905
0.0233767 0.00761219 0.000459943   0.000867534
0.0236105 0.00778578 0.000459496   0.000872209
0.0238466 0.00850857 0.00047614 0.000876931
0.024085   0.00776495 0.000443963   0.0008817
0.0243259 0.0082436 0.000464478   0.000886517
0.0245691 0.00807254 0.00045419 0.000891383
0.0248148 0.00939075 0.000490891   0.000896296
0.025063   0.00959313 0.000505701   0.000901259
0.0253136 0.0092104 0.00048328 0.000906272
0.0255667 0.00857452 0.000439316   0.000911335
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0.0263414 0.00644215 0.000365696   0.000926829
0.0266048 0.0053493 0.000350555   0.000932097
0.0268709 0.00589853 0.000372464   0.000937418
0.0271396 0.00440241 0.000306083   0.000942792
0.027411   0.00436036 0.000299895   0.00094822
0.0276851 0.00394724 0.000288316   0.000953702
0.027962   0.00370745 0.000276583   0.000959239
0.0282416 0.00371265 0.000281898   0.000964832
0.028524   0.00467631 0.000328059   0.00097048
0.0288092 0.00451466 0.00031176 0.000976185
0.0290973 0.00518772 0.000336427   0.000981947
0.0293883 0.00518976 0.000339398   0.000987766
0.0296822 0.00516584 0.000338216   0.000993644
0.029979   0.00519832 0.000336096   0.00099958
0.0302788 0.00468753 0.000304599   0.00100558
0.0305816 0.00474851 0.000319092   0.00101163
0.0308874 0.00397074 0.000280485   0.00101775
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0.0315082 0.00273978 0.000229589   0.00103016
0.0318233 0.00207565 0.0001902 0.00103647
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0.032463   0.00163389 0.000181721   0.00104926
0.0327876 0.00125678 0.000158181   0.00105575
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0.0334466 0.00113828 0.000146878   0.00106893
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0.0341189 0.00151183 0.000160976   0.00108238
0.0344601 0.00188291 0.000180584   0.0010892
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0.0365801 0.00126721 0.000143245   0.0011316
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0.038446   0.000935704   0.000118671   0.00116892
0.0388305 0.000798788   0.00010822 0.00117661
0.0392188 0.000703116   0.000101704   0.00118438
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0.0400071 0.000876336   0.000114322   0.00120014
0.0404072 0.000755396   0.000108281   0.00120814
0.0408112 0.000593702   9.30522e-05   0.00121622
0.0412194 0.000651555   9.69116e-05   0.00122439
0.0416316 0.000465573   8.31534e-05   0.00123263
0.0420479 0.000415053   7.83589e-05   0.00124096
0.0424683 0.000452865   3.0412e-05 0.00124937
0.042893   0.0004541 3.08656e-05   0.00125786
0.043322   0.000446236   2.94633e-05   0.00126644
0.0437552 0.000501797   3.16369e-05   0.0012751
0.0441927 0.000528715   3.22161e-05   0.00128385
0.0446347 0.00052634 3.16765e-05   0.00129269
0.045081   0.00052103 3.12054e-05   0.00130162
0.0455318 0.000449583   2.76212e-05   0.00131064
0.0459871 0.000477269   2.83582e-05   0.00131974
0.046447   0.000389309   2.57439e-05   0.00132894
0.0469115 0.000368836   2.4896e-05 0.00133823
0.0473806 0.000293585   2.13585e-05   0.00134761
0.0478544 0.000245658   2.00503e-05   0.00135709
0.0483329 0.000226262   1.99709e-05   0.00136666
0.0488163 0.000221311   1.91501e-05   0.00137633
0.0493044 0.000204117   1.86122e-05   0.00138609
0.0497975 0.000217471   1.80955e-05   0.00139595
0.0502955 0.000207846   1.70908e-05   0.00140591
0.0507984 0.00023711 1.93239e-05   0.00141597
0.0513064 0.000193493   1.69432e-05   0.00142613
0.0518195 0.000196532   1.76669e-05   0.00143639
0.0523376 0.000190344   1.71628e-05   0.00144675
0.052861   0.000173728   1.62824e-05   0.00145722
0.0533896 0.000165318   1.59738e-05   0.00146779
0.0539235 0.000145675   1.47814e-05   0.00147847
0.0544628 0.000142186   1.43442e-05   0.00148926
0.0550074 0.000145133   1.44928e-05   0.00150015
0.0555575 0.000145424   1.40034e-05   0.00151115
0.056113   0.000123083   1.27573e-05   0.00152226
0.0566742 0.000103196   1.14656e-05   0.00153348
0.0572409 9.97994e-05   1.1307e-05 0.00154482
0.0578133 9.34347e-05   1.1235e-05 0.00155627
0.0583915 7.99023e-05   1.04132e-05   0.00156783
0.0589754 8.71885e-05   1.0694e-05 0.00157951
0.0595651 8.15373e-05   1.06479e-05   0.0015913
0.0601608 7.14228e-05   1.06233e-05   0.00160322
0.0607624 6.66375e-05   9.93683e-06   0.00161525

0.06137	7.13538e-05	1.02137e-05	0.0016274
0.0619837	6.37109e-05	9.26365e-06	0.00163967
0.0626035	6.63256e-05	9.33761e-06	0.00165207
0.0632296	4.98592e-05	8.44245e-06	0.00166459
0.0638619	6.27997e-05	8.97457e-06	0.00167724
0.0645005	3.86406e-05	7.41872e-06	0.00169001
0.0651455	3.30049e-05	7.26112e-06	0.00170291
0.065797	4.60938e-05	7.62452e-06	0.00171594
0.0664549	4.41998e-05	7.54786e-06	0.0017291
0.0671195	3.63201e-05	7.02366e-06	0.00174239
0.0677907	3.812e-05	7.14636e-06	0.00175581
0.0684686	3.02456e-05	6.31541e-06	0.00176937
0.0691533	4.09918e-05	7.06589e-06	0.00178307
0.0698448	3.35501e-05	7.05062e-06	0.0017969
0.0705432	3.54822e-05	6.28076e-06	0.00181086
0.0712487	1.75932e-05	4.97575e-06	0.00182497
0.0719612	1.47984e-05	4.95834e-06	0.00183922
0.0726808	2.8194e-05	6.19774e-06	0.00185362
0.0734076	2.14396e-05	5.44178e-06	0.00186815
0.0741417	2.44345e-05	5.76487e-06	0.00188283
0.0748831	1.48593e-05	4.51948e-06	0.00189766
0.0756319	1.66839e-05	2.51421e-06	0.00191264
0.0763882	1.41253e-05	2.35574e-06	0.00192776
0.0771521	1.2142e-05	2.26224e-06	0.00194304
0.0779236	1.22434e-05	2.35513e-06	0.00195847
0.0787029	1.38555e-05	2.32608e-06	0.00197406
0.0794899	1.1312e-05	2.09927e-06	0.0019898
0.0802848	8.95186e-06	1.94972e-06	0.0020057
0.0810876	1.33369e-05	2.2043e-06	0.00202175
0.0818985	1.45379e-05	2.25348e-06	0.00203797
0.0827175	1.21097e-05	2.0759e-06	0.00205435
0.0835447	1.17902e-05	2.1034e-06	0.00207089
0.0843801	7.3004e-06	1.88329e-06	0.0020876
0.0852239	8.86582e-06	1.86877e-06	0.00210448
0.0860762	9.71836e-06	1.87692e-06	0.00212152
0.0869369	5.71058e-06	1.72906e-06	0.00213874
0.0878063	5.17586e-06	1.61396e-06	0.00215613
0.0886844	1.08932e-05	1.88198e-06	0.00217369
0.0895712	3.15033e-06	1.6773e-06	0.00219142
0.0904669	7.73089e-06	1.90959e-06	0.00220934
0.0913716	5.9318e-06	1.66535e-06	0.00222743
0.0922853	9.30461e-06	1.85571e-06	0.00224571
0.0932082	4.54591e-06	1.54883e-06	0.00226416
0.0941402	9.32296e-06	1.82631e-06	0.0022828
0.0950816	6.10638e-06	1.63689e-06	0.00230163
0.0960325	6.8089e-06	1.72916e-06	0.00232065
0.0969928	3.91327e-06	1.58316e-06	0.00233986
0.0979627	3.50034e-06	1.58414e-06	0.00235925
0.0989423	6.71538e-06	1.61302e-06	0.00237885
0.0999318	5.41472e-06	1.50321e-06	0.00239864
0.100931	2.68868e-06	1.48972e-06	0.00241862
0.10194	4.64814e-06	1.55699e-06	0.00243881

0.10296	8.09986e-06	1.7328e-06	0.0024592
0.103989	4.12924e-06	1.39465e-06	0.00247979
0.105029	6.78492e-06	1.78678e-06	0.00250059
0.10608	5.4348e-06	1.68882e-06	0.00252159
0.10714	3.18732e-06	1.57975e-06	0.00254281
0.108212	2.87377e-06	1.5278e-06	0.00256424
0.109294	3.28106e-06	1.48264e-06	0.00258588
0.110387	3.13315e-06	1.37755e-06	0.00260774
0.111491	4.39972e-06	1.41336e-06	0.00262981
0.114869	4.69227e-06	1.38631e-06	0.00269738
0.116018	1.19622e-06	1.1766e-06	0.00272035
0.117178	5.80048e-06	1.38462e-06	0.00274356
0.11835	4.70173e-06	1.37305e-06	0.00276699
0.119533	3.06059e-06	1.16887e-06	0.00279066
0.120728	1.72843e-06	1.2635e-06	0.00281457
0.121936	3.34172e-06	1.33796e-06	0.00283871
0.123155	5.90501e-06	1.37747e-06	0.0028631
0.124387	3.03267e-06	1.0905e-06	0.00288773
0.125631	2.90022e-06	1.08762e-06	0.00291261
0.126887	2.60573e-06	1.25282e-06	0.00293774
0.128156	4.78294e-06	1.28893e-06	0.00296311
0.129437	4.44207e-06	1.39326e-06	0.00298874
0.133359	4.10491e-06	1.35455e-06	0.00306719
0.134693	1.29773e-06	1.19857e-06	0.00309386
0.13604	2.03862e-06	1.08274e-06	0.0031208
0.1374	2.42217e-06	1.0806e-06	0.003148
0.138774	1.10193e-06	1.00972e-06	0.00317548
0.140162	2.22604e-06	1.10534e-06	0.00320324
0.141564	1.48178e-06	1.0997e-06	0.00323127
0.145853	1.14086e-06	1.10465e-06	0.00331706
0.147312	2.77041e-06	1.10088e-06	0.00334623
0.148785	3.47893e-06	1.26931e-06	0.0033757
0.150273	3.35233e-06	1.16127e-06	0.00340545
0.151775	2.59738e-06	1.11494e-06	0.00343551
0.153293	1.55668e-06	1.04214e-06	0.00346586
0.154826	1.93307e-06	1.10412e-06	0.00349652
0.156374	1.55787e-06	1.10769e-06	0.00352749
0.161113	3.48093e-06	1.2217e-06	0.00362225
0.162724	1.94419e-06	1.12181e-06	0.00365447
0.164351	3.11964e-06	1.12466e-06	0.00368702
0.165994	2.56277e-06	1.1561e-06	0.00371989