

SUPPORTING INFORMATION

Interfacing human induced pluripotent stem cell-derived neurons with designed nanowire arrays as a future platform for medical applications

Jann Harberts, Undine Haferkamp, Stefanie Haugg, Cornelius Fendler, Dennis Lam, Robert Zierold, Ole Pless, and Robert H. Blick

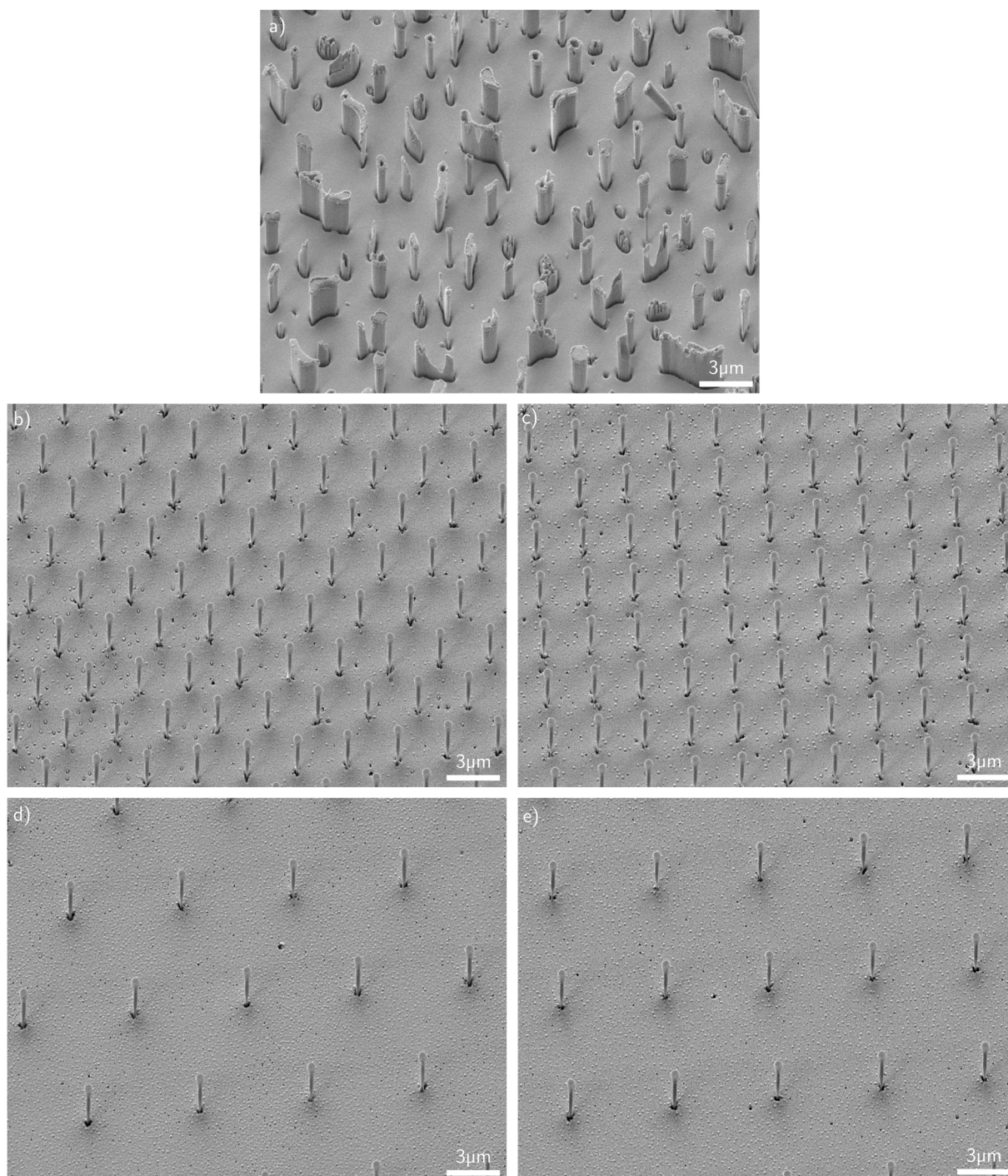


Figure S1: Sample overviews of the NW substrates. a) Random HD NWs. b) Hexagonal HD NWs. c) Rectangular HD NWs. d) Hexagonal LD NWs. e) Rectangular LD NWs.

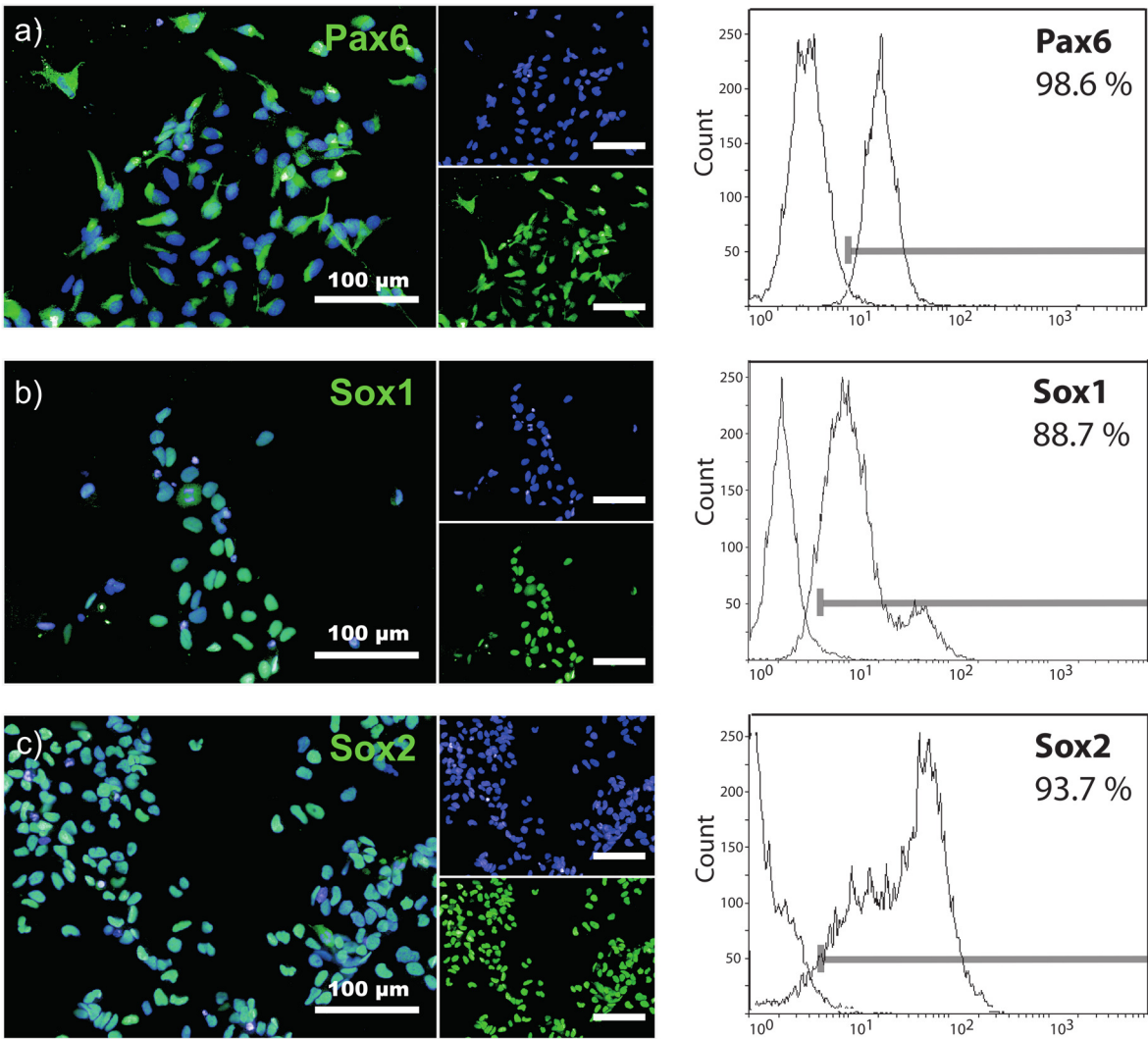


Figure S2: Characterization of human iPSC-derived neural precursor cells (iNPCs). a-c) Immunofluorescence staining and flow cytometry analysis of characteristic NPC marker proteins Pax6, Sox1 and Sox2.

Array	Type	Array	Type	MeanDiff	SEM	q Value	Prob	Alpha	Sig	LCL	UCL
Control	(AI2O3)	Control	(Glass)	-7.74477	7.18033	1.52538	0.92816	0.001	0	-42.98691	27.49737
Random	(HD)	Control	(Glass)	-8.22342	6.55472	1.77424	0.865	0.001	0	-40.39495	23.9481
Random	(HD)	Control	(AI2O3)	-0.47865	6.55472	0.10327	1	0.001	0	-32.65018	31.69287
Hexagonal	(HD)	Control	(Glass)	-7.36123	7.18033	1.44984	0.94272	0.001	0	-42.60337	27.88091
Hexagonal	(HD)	Control	(AI2O3)	0.38354	7.18033	0.07554	1	0.001	0	-34.8586	35.62568
Hexagonal	(HD)	Random	(HD)	0.86219	6.55472	0.18602	1	0.001	0	-31.30933	33.03372
Rectangular	(HD)	Control	(Glass)	-2.18024	7.18033	0.42941	0.99992	0.001	0	-37.42238	33.0619
Rectangular	(HD)	Control	(AI2O3)	5.56453	7.18033	1.09597	0.98521	0.001	0	-29.67761	40.80667
Rectangular	(HD)	Random	(HD)	6.04318	6.55472	1.30385	0.96506	0.001	0	-26.12834	38.21471
Rectangular	(HD)	Hexagonal	(HD)	5.18099	7.18033	1.02043	0.98977	0.001	0	-30.06115	40.42313
Hexagonal	(LD)	Control	(Glass)	-0.20669	7.18033	0.04071	1	0.001	0	-35.44883	35.03545
Hexagonal	(LD)	Control	(AI2O3)	7.53808	7.18033	1.48467	0.93627	0.001	0	-27.70406	42.78022
Hexagonal	(LD)	Random	(HD)	8.01674	6.55472	1.72965	0.87801	0.001	0	-24.15479	40.18826
Hexagonal	(LD)	Hexagonal	(HD)	7.15454	7.18033	1.40913	0.9497	0.001	0	-28.0876	42.39668
Hexagonal	(LD)	Rectangular	(HD)	1.97355	7.18033	0.3887	0.99996	0.001	0	-33.26859	37.21569
Rectangular	(LD)	Control	(Glass)	-6.87914	7.18033	1.35489	0.95809	0.001	0	-42.12128	28.363
Rectangular	(LD)	Control	(AI2O3)	0.86563	7.18033	0.17049	1	0.001	0	-34.37651	36.10777
Rectangular	(LD)	Random	(HD)	1.34428	6.55472	0.29004	0.99999	0.001	0	-30.82725	33.51581
Rectangular	(LD)	Hexagonal	(HD)	0.48209	7.18033	0.09495	1	0.001	0	-34.76005	35.72423
Rectangular	(LD)	Rectangular	(HD)	-4.6989	7.18033	0.92548	0.99389	0.001	0	-39.94104	30.54324
Rectangular	(LD)	Hexagonal	(LD)	-6.67246	7.18033	1.31418	0.96371	0.001	0	-41.9146	28.56969

Figure S3: ANOVA with post hoc Turkey's test of cell viability, alpha = 0.001.

Figure S4: ANOVA with post hoc Turkey's test of electrophysiological parameters, alpha = 0.001.

Array	Type	Array	Type	MeanDiff	SEM	q Value	Prob	Alpha	Sig	LCL	UCL
AP height											
Control	(Glass)	Control	(Al2O3)	-6.89821	8.06616	1.20944	0.97726	0.001	0	-42.88118	29.08475
Random	(HD)	Control	(Al2O3)	3.95893	8.06616	0.69411	0.99886	0.001	0	-32.02404	39.9419
Random	(HD)	Control	(Glass)	10.85714	8.3307	1.8431	0.84683	0.001	0	-26.30591	48.02019
Hexagonal	(HD)	Control	(Al2O3)	5.85893	8.06616	1.02723	0.99019	0.001	0	-30.12404	41.8419
Hexagonal	(HD)	Control	(Glass)	12.75714	8.3307	2.16564	0.72482	0.001	0	-24.40591	49.92019
Hexagonal	(HD)	Random	(HD)	1.9	8.3307	0.32254	0.99999	0.001	0	-35.26305	39.06305
Rectangular	(HD)	Control	(Al2O3)	-0.2125	8.41703	0.0357	1	0.001	0	-37.76067	37.33567
Rectangular	(HD)	Control	(Glass)	6.68571	8.67087	1.09044	0.9866	0.001	0	-31.99481	45.36624
Rectangular	(HD)	Random	(HD)	-4.17143	8.67087	0.68036	0.99898	0.001	0	-42.85196	34.5091
Rectangular	(HD)	Hexagonal	(HD)	-6.07143	8.67087	0.99025	0.99192	0.001	0	-44.75196	32.6091
Hexagonal	(LD)	Control	(Al2O3)	14.05	7.79266	2.5498	0.55305	0.001	0	-20.71285	48.81285
Hexagonal	(LD)	Control	(Glass)	20.94821	8.06616	3.67278	0.15122	0.001	0	-15.03475	56.93118
Hexagonal	(LD)	Random	(HD)	10.09107	8.06616	1.76923	0.86993	0.001	0	-25.8919	46.07404
Hexagonal	(LD)	Hexagonal	(HD)	8.19107	8.06616	1.43611	0.94776	0.001	0	-27.7919	44.17404
Hexagonal	(LD)	Rectangular	(HD)	14.2625	8.41703	2.39636	0.62311	0.001	0	-23.28567	51.81067
Rectangular	(LD)	Control	(Al2O3)	-4.45694	7.5731	0.8323	0.99685	0.001	0	-38.24036	29.32647
Rectangular	(LD)	Control	(Glass)	2.44127	7.85426	0.43957	0.99992	0.001	0	-32.59639	37.47893
Rectangular	(LD)	Random	(HD)	-8.41587	7.85426	1.51534	0.93318	0.001	0	-43.45353	26.62179
Rectangular	(LD)	Hexagonal	(HD)	-10.31587	7.85426	1.85744	0.84212	0.001	0	-45.35353	24.72179
Rectangular	(LD)	Rectangular	(HD)	-4.24444	8.21418	0.73075	0.99848	0.001	0	-40.88771	32.39882
Rectangular	(LD)	Hexagonal	(LD)	-18.50694	7.5731	3.45602	0.20485	0.001	0	-52.29036	15.27647
RMP											
Control	(Glass)	Control	(Al2O3)	5.20714	3.93721	1.87036	0.8378	0.001	0	-12.35664	22.77092
Random	(HD)	Control	(Al2O3)	2.49286	3.93721	0.89541	0.9953	0.001	0	-15.07092	20.05664
Random	(HD)	Control	(Glass)	-2.71429	4.06633	0.94399	0.99375	0.001	0	-20.85408	15.42551
Hexagonal	(HD)	Control	(Al2O3)	6.62143	3.93721	2.37837	0.63127	0.001	0	-10.94235	24.18521
Hexagonal	(HD)	Control	(Glass)	1.41429	4.06633	0.49187	0.99984	0.001	0	-16.72551	19.55408
Hexagonal	(HD)	Random	(HD)	4.12857	4.06633	1.43586	0.94781	0.001	0	-14.01122	22.26837
Rectangular	(HD)	Control	(Al2O3)	7.35	4.10847	2.53001	0.56209	0.001	0	-10.97778	25.67778
Rectangular	(HD)	Control	(Glass)	2.14286	4.23237	0.71602	0.99864	0.001	0	-16.73764	21.02336
Rectangular	(HD)	Random	(HD)	4.85714	4.23237	1.62298	0.90947	0.001	0	-14.02336	23.73764
Rectangular	(HD)	Hexagonal	(HD)	0.72857	4.23237	0.24345	1	0.001	0	-18.15193	19.60907
Hexagonal	(LD)	Control	(Al2O3)	-3.8875	3.8037	1.44537	0.94618	0.001	0	-20.85573	13.08073
Hexagonal	(LD)	Control	(Glass)	-9.09464	3.93721	3.26672	0.2619	0.001	0	-26.65842	8.46914
Hexagonal	(LD)	Random	(HD)	-6.38036	3.93721	2.29177	0.67012	0.001	0	-23.94414	11.18342
Hexagonal	(LD)	Hexagonal	(HD)	-10.50893	3.93721	3.77472	0.13009	0.001	0	-28.07271	7.05485
Hexagonal	(LD)	Rectangular	(HD)	-11.2375	4.10847	3.86816	0.11286	0.001	0	-29.56528	7.09028
Rectangular	(LD)	Control	(Al2O3)	3.45	3.69653	1.31989	0.96501	0.001	0	-13.04015	19.94015
Rectangular	(LD)	Control	(Glass)	-1.75714	3.83377	0.64818	0.99923	0.001	0	-18.85951	15.34522
Rectangular	(LD)	Random	(HD)	0.95714	3.83377	0.35307	0.99998	0.001	0	-16.14522	18.05951
Rectangular	(LD)	Hexagonal	(HD)	-3.17143	3.83377	1.16989	0.98077	0.001	0	-20.27379	13.93093
Rectangular	(LD)	Rectangular	(HD)	-3.9	4.00945	1.37561	0.95734	0.001	0	-21.78608	13.98608
Rectangular	(LD)	Hexagonal	(LD)	7.3375	3.69653	2.80717	0.43801	0.001	0	-9.15265	23.82765
MC											
Control	(Glass)	Control	(Al2O3)	-3.04107	4.37508	0.98301	0.99223	0.001	0	-22.55818	16.47604
Random	(HD)	Control	(Al2O3)	-2.12679	4.37508	0.68747	0.99892	0.001	0	-21.64389	17.39032
Random	(HD)	Control	(Glass)	0.91429	4.51856	0.28615	0.99999	0.001	0	-19.2429	21.07147
Hexagonal	(HD)	Control	(Al2O3)	1.13036	4.37508	0.36538	0.99997	0.001	0	-18.38675	20.64747
Hexagonal	(HD)	Control	(Glass)	4.17143	4.51856	1.30557	0.96682	0.001	0	-15.98575	24.32861
Hexagonal	(HD)	Random	(HD)	3.25714	4.51856	1.01942	0.99058	0.001	0	-16.90004	23.41433
Rectangular	(HD)	Control	(Al2O3)	0.9375	4.56538	0.29041	0.99999	0.001	0	-19.42857	21.30357
Rectangular	(HD)	Control	(Glass)	3.97857	4.70307	1.19636	0.97847	0.001	0	-17.00169	24.95883
Rectangular	(HD)	Random	(HD)	3.06429	4.70307	0.92143	0.99451	0.001	0	-17.91598	24.04455
Rectangular	(HD)	Hexagonal	(HD)	-0.19286	4.70307	0.05799	1	0.001	0	-21.17312	20.7874
Hexagonal	(LD)	Control	(Al2O3)	-2.575	4.22672	0.86157	0.99619	0.001	0	-21.43032	16.28032
Hexagonal	(LD)	Control	(Glass)	0.46607	4.37508	0.15065	1	0.001	0	-19.05104	19.98318
Hexagonal	(LD)	Random	(HD)	-0.44821	4.37508	0.14488	1	0.001	0	-19.96532	19.06889
Hexagonal	(LD)	Hexagonal	(HD)	-3.70536	4.37508	1.19773	0.97835	0.001	0	-23.22247	15.81175
Hexagonal	(LD)	Rectangular	(HD)	-3.5125	4.56538	1.08806	0.98675	0.001	0	-23.87857	16.85357
Rectangular	(LD)	Control	(Al2O3)	2.86639	4.10764	0.98687	0.99207	0.001	0	-15.45769	21.19046
Rectangular	(LD)	Control	(Glass)	5.90746	4.26014	1.96107	0.80589	0.001	0	-13.09691	24.91184
Rectangular	(LD)	Random	(HD)	4.99317	4.26014	1.65756	0.90088	0.001	0	-14.0112	23.99755
Rectangular	(LD)	Hexagonal	(HD)	1.73603	4.26014	0.5763	0.99961	0.001	0	-17.28834	20.74041
Rectangular	(LD)	Rectangular	(HD)	1.92889	4.45536	0.61227	0.99944	0.001	0	-17.94636	21.80414
Rectangular	(LD)	Hexagonal	(LD)	5.44139	4.10764	1.87341	0.83678	0.001	0	-12.88269	23.76546
IR											
Control	(Glass)	Control	(Al2O3)	0.8875	0.36622	3.4272	0.21291	0.001	0	-0.74621	2.52121
Random	(HD)	Control	(Al2O3)	0.37321	0.36622	1.44122	0.9469	0.001	0	-1.26049	2.00692
Random	(HD)	Control	(Glass)	-0.51429	0.37823	1.92292	0.81965	0.001	0	-2.20157	1.173
Hexagonal	(HD)	Control	(Al2O3)	0.07321	0.36622	0.28273	0.99999	0.001	0	-1.56049	1.70692
Hexagonal	(HD)	Control	(Glass)	-0.81429	0.37823	3.04462	0.3409	0.001	0	-2.50157	0.873
Hexagonal	(HD)	Random	(HD)	-0.3	0.37823	1.1217	0.98449	0.001	0	-1.98728	1.38728
Rectangular	(HD)	Control	(Al2O3)	0.50417	0.38215	1.86575	0.83935	0.001	0	-1.2006	2.20894
Rectangular	(HD)	Control	(Glass)	-0.38333	0.39368	1.37706	0.95712	0.001	0	-2.13951	3.37285
Rectangular	(HD)	Random	(HD)	0.13095	0.39368	0.47042	0.99988	0.001	0	-1.62523	1.88713
Rectangular	(HD)	Hexagonal	(HD)	0.43095	0.39368	1.54812	0.92644	0.001	0	-1.32523	2.18713
Hexagonal	(LD)	Control	(Al2O3)	1	0.3538	3.99717	0.09218	0.001	0	-0.57831	2.57831
Hexagonal	(LD)	Control	(Glass)	0.1125	0.36622	0.43443	0.99992	0.001	0	-1.52121	1.74621
Hexagonal	(LD)	Random	(HD)	0.62679	0.36622	2.42042	0.61217	0.001	0	-1.00692	2.26049
Hexagonal	(LD)	Hexagonal	(HD)	0.92679	0.36622	3.57891	0.17295	0.001	0	-0.70692	2.56049
Hexagonal	(LD)	Rectangular	(HD)	0.49583	0.38215	1.83491	0.8495	0.001	0	-1.20894	2.2006
Rectangular	(LD)	Control	(Al2O3)	0.39861	0.34384	1.63951	0.90542	0.001	0	-1.13523	1.93245
Rectangular	(LD)	Control	(Glass)	-0.48889	0.3566	1.93885	0.81396	0.001	0	-2.07968	1.1019
Rectangular	(LD)	Random	(HD)	0.0254	0.3566	0.10072	1	0.001	0	-1.56539	1.61618
Rectangular	(LD)	Hexagonal	(HD)	0.3254	0.3566	1.29047	0.96865	0.001	0	-1.26539	1.91618
Rectangular	(LD)	Rectangular	(HD)	-0.10556	0.37294	0.40027	0.99995	0.001	0	-1.76924	1.55813
Rectangular	(LD)	Hexagonal	(LD)	-0.60139	0.34384	2.47355	0.58792	0.001	0	-2.13523	0.93245
MTC											
Control	(Glass)	Control	(Al2O3)	3.69286	6.90864	0.75594	0.99816	0.001	0	-27.12641	34.51212
Random	(HD)	Control	(Al2O3)	-2.36429	6.90864	0.48397	0.99986	0.001	0	-33.18355	28.45498
Random	(HD)	Control	(Glass)	-6.05714	7.13521	1.20054	0.97809	0.001	0	-37.88715	25.77286
Hexagonal	(HD)	Control	(Al2O3)	2.69286	6.90864	0.55123	0.99969	0.001	0	-28.12641	33.51212
Hexagonal	(HD)	Control	(Glass)	-1	7.13521	0.1982	1	0.001	0	-32.83	30.83
Hexagonal	(HD)	Random	(HD)	5.05714	7.13521	1.00234	0.99139	0.001	0	-26.77286	36.38715
Rectangular	(HD)	Control	(Al2O3)	-0.91667	7.20915	0.17982	1	0.001	0	-33.07652	31.25319
Rectangular	(HD)	Control	(Glass)	-4.60952	7.42656	0.87778	0.99579	0.001	0	-37.73924	28.52019
Rectangular	(HD)	Random	(HD)	1.44762	7.42656	0.27566	0.99999	0.001	0	-31.6821	34.57734
Rectangular	(HD)	Hexagonal	(HD)	-3.60952	7.42656	0.68735	0.99892	0.001	0	-36.73924	29.52019
Hexagonal	(LD)	Control	(Al2O3)	11.05	6.67438	2.34135	0.64798	0.001	0	-18.72424	40.82424
Hexagonal	(LD)	Control	(Glass)	7.35714	6.90864	1.50602	0.93502	0.001	0	-23.46212	38.17641
Hexagonal	(LD)	Random	(HD)	13.41429	6.90864	2.74593	0.46472	0.001	0	-17.40498	44.23355
Hexagonal	(LD)	Hexagonal	(HD)	8.35714	6.90864	1.71073	0.88676	0.001	0	-22.46212	39.17641
Hexagonal	(LD)	Rectangular	(HD)	11.96667	7.20915	2.34749					