**Figure 1.** Time-dependent contact angle, CA(t), for:

1. **Clean glass beads**

x=[ 0.595041667 21.7921 51.26873333 76.77233333 100.6093333 121.2056667 150.5893333 201.5266667 239.8966667 299.2503333 357.6676667 397.9573333]%Time

y=[ 27.24763333 26.89066667 26.72933333 26.18793333 25.8519 25.6938 25.43823333 24.55733333 24.0757 23.7361 22.8061 22.6425] %Contact angle

e=[ 1.138297859 0.922298037 0.921437085 0.749325636 0.693823671 0.684844002 0.736070818 1.253471649 1.267924227 1.224986588 0.471265665 0.506873048]%standard deviation

1. **Ethanol coated glass beads**

x=[ 0.629146 23.76773333 52.2191 77.5247 101.6423333 122.4036667 152.952 202.8646667 244.1786667 301.85 361.0596667]%Time

y=[ 44.05046667 43.37453333 42.6174 42.06716667 41.94646667 41.97876667 41.87203333 41.62623333 41.5078 40.93193333 40.6503] %Contact angle

e=[ 0.979096421 1.199150114 0.816153421 1.268192005 1.250838496 1.260994746 1.264928818 1.245278824 1.264656636 1.184195261 1.202074218]% standard deviation

1. **Oleic-acid coated glass beads**

x=[ 0.590711333 21.83233333 52.11663333 77.0315 103.3936667 122.5706667 150.8336667 203.151 242.568 301.736 360.8103333] %Time

y=[ 55.06433333 45.0816 38.65523333 35.9711 34.25126667 33.95156667 33.20493333 32.26303333 31.92593333 31.24496667 30.75243333] %Contact angle

e=[ 1.096899999 3.576017093 2.776826861 1.38546059 0.48883673 0.333514231 0.724408454 0.49130158 0.589270692 0.432693659 0.422289272] %standard deviation

**Figure 2.** Wetting front position versus time for:

1. **Clean glass beads**

x=[ 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400 420 440 460 480 500 520 540 560 580 600 620 640 660 680 700 720 740 760 780]%Time

y=[ 0 3.604780879 6.32502222 8.55493607 10.70959397 12.67706293 14.52466972 16.28860707 18.00838129 19.60745641 21.23117086 22.78784315 24.27003781 25.73696351 27.21470125 28.56304922 30.0046179 31.40319094 32.73641382 34.04758413 35.42650504 36.72635786 38.0152055 39.33779637 40.60072474 41.80013294 43.08683397 44.35666269 45.61719872 46.82734545 48.05000054 49.26290185 50.47825295 51.68347971 52.89175554 54.07416122 55.31000409 56.48272993 57.70399721 58.89477083] %Wetting front position [cm]

e=[ 0 0.613119487 0.659582845 0.549975962 0.566967945 0.530008476 0.521823261 0.436205168 0.4542085 0.405346084 0.368447915 0.294121234 0.323507083 0.247988358 0.214387828 0.259102626 0.246868527 0.236772355 0.25120559 0.273886938 0.290166663 0.326879949 0.291225219 0.368142205 0.426287325 0.452405015 0.499475296 0.517737551 0.555379634 0.550022302 0.620506229 0.660747498 0.697180545 0.711319786 0.761126736 0.827823996 0.862816694 0.846609487 0.868281599 0.800554635] % standard deviation

1. **Ethanol coated glass beads**

x=[ 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400 420 440 460 480 500 520 540 560 580 600 620 640 660 680 700 720 740 760 780 800 820 840 860 880 900]%Time

y=[ 0 3.063686131 5.263183815 7.105472772 8.743244507 10.32247536 11.90621273 13.3372406 14.81018446 16.1119422 17.46603081 18.82913028 20.03444153 21.29894563 22.61451329 23.85308955 25.0280099 26.22516492 27.45972505 28.68713858 29.87243128 31.04395752 32.23568636 33.40701348 34.59263968 35.78208848 36.96237247 38.14286379 39.32530382 40.4686661 41.60042663 42.73617147 43.88204812 45.04956691 46.20165266 47.33532123 48.46747005 49.56296284 50.6511973 51.80366884 52.94484793 54.07226256 55.19808666 56.29471217 57.39405737 58.38805353] %Wetting front position [cm]

e=[ 0 0.439870353 0.418139586 0.316662171 0.209505124 0.174609211 0.018567135 0.020983302 0.089333153 0.216555314 0.200846065 0.259569022 0.345003637 0.310368171 0.373701515 0.405347169 0.477888737 0.467489148 0.48185183 0.507516953 0.519091095 0.597207929 0.62032843 0.597269609 0.582718257 0.568030881 0.643009008 0.671395122 0.671645374 0.65389447 0.656474224 0.707457294 0.766109007 0.766116337 0.789761129 0.790175553 0.779700258 0.808310305 0.859213905 0.862981469 0.865542048 0.87891837 0.90228918 0.895325776 0.891938957 0.87412427] % standard deviation

1. **Oleic-acid coated glass beads**

x=[ 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400 420 440 460 480 500 520 540 560 580 600 620 640 660 680 700 720 740 760 780 800 820 840 860 880 900 920 940 960 980]%Time

y=[ 0 2.269082595 4.144121356 5.895129769 7.27510786 8.787894121 10.24758357 11.52616681 12.8923351 14.22449477 15.50381065 16.76469179 17.99224049 19.20828418 20.43815514 21.64513898 22.81486361 23.94503134 25.09938905 26.25421136 27.41988424 28.56487548 29.67500744 30.78600608 31.90191052 33.00771201 34.12940851 35.24136296 36.34190118 37.45211969 38.53474287 39.62242529 40.71363108 41.80076408 42.88235153 43.96072342 45.03402303 46.10964904 47.18899332 48.25127574 49.34887551 50.39896322 51.45631316 52.50724694 53.56684498 54.61180473 55.6680744 56.69765487 57.74566007 58.78544574] %Wetting front position [cm]

e=[ 0 0.141036874 0.160153663 0.160943804 0.142827992 0.189502758 0.222413948 0.250618903 0.291528584 0.310136401 0.291862581 0.287687573 0.345072787 0.379356173 0.380080485 0.390108658 0.405352206 0.37752258 0.370394619 0.358942779 0.378821262 0.396314634 0.421265192 0.442280404 0.450802381 0.460179846 0.454255797 0.442511357 0.438273051 0.429820582 0.432815938 0.436829505 0.435839164 0.43794508 0.431008413 0.430948096 0.431254121 0.438275186 0.434281268 0.447073609 0.447928412 0.457964791 0.461468333 0.465499926 0.460763307 0.464862725 0.466540802 0.473143188 0.450878627 0.452699015] % standard deviation

**Figures 3a and 3b.** versus and versus data plot for clean glass beads:

ql=[ 0 1.41015E-05 2.01829E-05 2.52632E-05 2.83273E-05 3.05209E-05 3.45946E-05 3.83535E-05 4.05587E-05 4.23942E-05 4.4785E-05 4.63708E-05 4.72574E-05 4.98913E-05 5.3319E-05 5.44163E-05 5.42439E-05 5.53312E-05 5.7392E-05 6.09339E-05 6.13875E-05 6.2885E-05 6.41917E-05 6.4157E-05 6.92225E-05 6.75636E-05 6.45006E-05 7.18405E-05 7.44243E-05 6.92249E-05 7.40415E-05 7.77742E-05 7.36128E-05 7.89134E-05 8.22921E-05 7.85808E-05 8.30867E-05 8.07721E-05 8.17568E-05 8.81781E-05 8.45836E-05 8.61688E-05 8.98227E-05 8.86985E-05 9.06477E-05 9.41173E-05 8.98922E-05 9.28102E-05 9.87032E-05 9.0961E-05 9.82887E-05 0.000100658 9.7931E-05 0.000102254 9.62738E-05 0.000104229 0.000106168 0.000102874 0.000107066 0.000106689 0.000108321 0.000108671 0.000110855 0.000111605 0.000111305 0.000113308 0.000117789 0.000116325 0.00011659 0.000116416 0.000120219 0.000124486 0.000120819 0.000120692 0.000120272 0.000128294 0.000125659 0.000130474 0.000137273]

l=[ 0 0.020002232 0.036047809 0.050151945 0.063250222 0.074568026 0.085549361 0.096505946 0.10709594 0.117053464 0.126770629 0.136250687 0.145246697 0.153909201 0.162886071 0.171710289 0.180083813 0.18806892 0.196074564 0.204001249 0.212311709 0.219697266 0.227878431 0.235023393 0.242700378 0.250515762 0.257369635 0.264135869 0.272147013 0.278991555 0.285630492 0.293064735 0.300046179 0.30640723 0.314031909 0.320641437 0.327364138 0.334430318 0.340475841 0.347494303 0.35426505 0.360455569 0.367263579 0.373742437 0.380152055 0.386705586 0.393377964 0.399121186 0.406007247 0.412330506 0.418001329 0.425107098 0.43086834 0.437453683 0.443566627 0.449250879 0.456171987 0.461893678 0.468273455 0.474315378 0.480500005 0.486560062 0.492629018 0.498789997 0.50478253 0.510774786 0.516834797 0.523154918 0.528917555 0.535129666 0.540741612 0.547207498 0.553100041 0.559073104 0.564827299 0.570643551 0.577039972 0.582473731 0.588947708]

t=[ 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400 410 420 430 440 450 460 470 480 490 500 510 520 530 540 550 560 570 580 590 600 610 620 630 640 650 660 670 680 690 700 710 720 730 740 750 760 770 780]

**Figures 3c and 3d.** versus and versus data plot for ethanol coated glass beads:

ql=[ 0 9.07589E-06 1.5533E-05 1.76619E-05 1.97155E-05 2.16893E-05 2.3384E-05 2.46732E-05 2.65787E-05 2.86128E-05 3.04196E-05 3.33179E-05 3.52878E-05 3.43839E-05 3.52245E-05 3.92624E-05 3.90809E-05 3.81483E-05 4.3256E-05 4.32882E-05 4.17403E-05 4.68569E-05 4.63535E-05 4.44236E-05 4.99644E-05 4.97162E-05 4.89838E-05 5.47821E-05 5.36991E-05 5.4534E-05 5.59365E-05 5.44591E-05 5.91366E-05 5.82909E-05 5.93113E-05 6.29392E-05 6.09682E-05 6.52991E-05 6.58536E-05 6.583E-05 6.77609E-05 6.75735E-05 7.0813E-05 7.15189E-05 7.14209E-05 7.29051E-05 7.45756E-05 7.65069E-05 7.90271E-05 7.95189E-05 8.0895E-05 8.14172E-05 8.12039E-05 8.40804E-05 8.49653E-05 8.68768E-05 8.50047E-05 8.64484E-05 8.98607E-05 8.81839E-05 9.29112E-05 9.09549E-05 9.33023E-05 9.42063E-05 9.43466E-05 9.85768E-05 9.53219E-05 9.96804E-05 9.74707E-05 0.000100484 0.000103616 0.000102804 0.000106268 0.000101983 0.000106892 0.000103572 0.000107779 0.000112143 0.000110057 0.000113476 0.000108595 0.000114402 0.000111409 0.000116584 0.00011552 0.000115814 0.000121177 0.000118463 0.00012134 0.000109195 0.00011649 0.000131924]

l=[ 0 0.015592449 0.030636861 0.042333891 0.052631838 0.062081343 0.071054728 0.07943442 0.087432445 0.095456674 0.103224754 0.110992723 0.119062127 0.126616645 0.133372406 0.140541487 0.148101845 0.154458702 0.161119422 0.168611365 0.174660308 0.181203713 0.188291303 0.194184336 0.200344415 0.207330479 0.212989456 0.219439863 0.226145133 0.231966676 0.238530895 0.244328925 0.250280099 0.256782767 0.262251649 0.26869093 0.27459725 0.280402276 0.286871386 0.292508221 0.298724313 0.304470747 0.310439575 0.316494353 0.322356864 0.328165865 0.334070135 0.339942388 0.345926397 0.351984723 0.357820885 0.363899467 0.369623725 0.375477042 0.381428638 0.38720556 0.393253038 0.398605724 0.404686661 0.410313249 0.416004266 0.422083592 0.427361715 0.43359049 0.438820481 0.444924429 0.450495669 0.456065998 0.462016527 0.467186247 0.473353212 0.478729321 0.484674701 0.490285077 0.495629628 0.501653837 0.506511973 0.512867047 0.518036688 0.524066054 0.529448479 0.534876491 0.540722626 0.545733467 0.551980867 0.556761948 0.562947122 0.568106894 0.573940574 0.579250614 0.583880535 0.589773408]

t=[ 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400 410 420 430 440 450 460 470 480 490 500 510 520 530 540 550 560 570 580 590 600 610 620 630 640 650 660 670 680 690 700 710 720 730 740 750 760 770 780 790 800 810 820 830 840 850 860 870 880 890 900 910]

**Figures 4a and 4b.** versus and versus data plot for oleic-acid coated glass beads:

ql=[ 0 4.69095E-06 8.9673E-06 1.12458E-05 1.36023E-05 1.62523E-05 1.6932E-05 1.67645E-05 2.11683E-05 2.27959E-05 2.09229E-05 2.54707E-05 2.74457E-05 2.5733E-05 2.99235E-05 3.10429E-05 2.97526E-05 3.33447E-05 3.40607E-05 3.50736E-05 3.71084E-05 3.75883E-05 3.98534E-05 3.95295E-05 4.08042E-05 4.19079E-05 4.17481E-05 4.50559E-05 4.62567E-05 4.69498E-05 4.71438E-05 4.80518E-05 4.87971E-05 4.88302E-05 5.1E-05 5.23375E-05 5.38043E-05 5.48325E-05 5.6278E-05 5.78569E-05 5.79368E-05 5.92484E-05 5.93533E-05 5.97523E-05 6.06923E-05 6.20695E-05 6.35069E-05 6.46442E-05 6.57221E-05 6.63369E-05 6.76145E-05 6.95924E-05 7.11199E-05 7.13078E-05 7.20774E-05 7.28272E-05 7.37762E-05 7.57158E-05 7.45816E-05 7.6001E-05 7.73333E-05 7.85386E-05 7.93093E-05 8.0984E-05 8.1907E-05 8.28653E-05 8.32038E-05 8.4591E-05 8.50646E-05 8.64824E-05 8.75028E-05 8.82134E-05 8.96428E-05 9.05484E-05 9.22469E-05 9.30125E-05 9.39311E-05 9.36706E-05 9.61698E-05 9.89729E-05 9.79001E-05 9.67534E-05 9.85636E-05 9.94946E-05 0.000101601 0.000100965 0.000103493 0.000103887 0.000104767 0.000104494 0.000106529 0.000107703 0.000108158 0.000106989 0.000110793 0.000110927 0.000112893 0.000112102 0.000113268 0.000111254]

l=[ 0 0.011075481 0.022690826 0.032455056 0.041441214 0.050212894 0.058951298 0.065757891 0.072751079 0.08149635 0.087878941 0.094371946 0.102475836 0.108859679 0.115261668 0.12290134 0.128923351 0.135391055 0.142244948 0.148339372 0.155038107 0.161286129 0.167646918 0.174145957 0.179922405 0.186415332 0.192082842 0.198176362 0.204381551 0.210420203 0.21645139 0.222200332 0.228148636 0.233768759 0.239450313 0.245289686 0.250993891 0.256885891 0.262542114 0.268481635 0.274198842 0.279911297 0.285648755 0.291149478 0.296750074 0.302213317 0.307860061 0.313373158 0.319019105 0.324518466 0.33007712 0.33560058 0.341294085 0.34687305 0.35241363 0.357936938 0.363419012 0.368918445 0.374521197 0.37969101 0.385347429 0.390546897 0.396224253 0.401374682 0.407136311 0.412256578 0.418007641 0.423023901 0.428823515 0.433754245 0.439607234 0.444520239 0.45034023 0.455286023 0.46109649 0.466105947 0.471889933 0.476871294 0.482512757 0.48764997 0.493488755 0.498379117 0.503989632 0.508955372 0.514563132 0.519634398 0.525072469 0.530293933 0.53566845 0.540870877 0.546118047 0.551420145 0.556680744 0.56192702 0.566976549 0.572494564 0.577456601 0.583067317 0.587854457 0.593487028]

t=[ 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400 410 420 430 440 450 460 470 480 490 500 510 520 530 540 550 560 570 580 590 600 610 620 630 640 650 660 670 680 690 700 710 720 730 740 750 760 770 780 790 800 810 820 830 840 850 860 870 880 890 900 910 920 930 940 950 960 970 980 990]