

Raw Data OLS Regressions

```
##  
## Call:  
## lm(formula = TOC ~ Ti.Al + Si.Al + P.Al + Ni.Al + Cu.Al + U.Al +  
##      Mo.Al + Fe.Al + Zr.Al, data = data.raw)  
##  
## Residuals:  
##      Min      1Q  Median      3Q      Max   
## -4.9031 -2.0012 -0.7024  1.5918  8.4089   
##  
## Coefficients:  
##              Estimate Std. Error t value Pr(>|t|)
```

```
## (Intercept)      0.6263      2.4565      0.255 0.800638
## Ti.Al           226.4025     61.5571     3.678 0.000989 ***
## Si.Al           -0.9275      0.3333    -2.783 0.009548 **
## P.Al            19.5503     184.5122     0.106 0.916372
## Ni.Al            6.4779     653.8505     0.010 0.992165
## Cu.Al           1051.8179    307.4756     3.421 0.001936 **
## U.Al            874.9099    1012.6129     0.864 0.394923
## Mo.Al           2003.8091    469.8448     4.265 0.000206 ***
## Fe.Al           -5.5120      4.0048    -1.376 0.179626
## Zr.Al          -2027.5112    879.9067    -2.304 0.028841 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.35 on 28 degrees of freedom
## Multiple R-squared:  0.7484, Adjusted R-squared:  0.6675
## F-statistic: 9.254 on 9 and 28 DF,  p-value: 2.365e-06
```

```
##
## Call:
## lm(formula = TOC ~ Ti.Al + Si.Al + P.Al + Ni.Al + Cu.Al + U.Al +
##      Mo.Al + Fe.Al + Zr.Al + Ti.Al:Si.Al + Ti.Al:Ni.Al + Ti.Al:Cu.Al,
##      data = data.raw)
```

```
## Residuals:
##      Min       1Q   Median       3Q      Max
## -3.9023 -1.7880 -0.2149  1.3257  8.3396
```

```
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -1.093e+01  6.938e+00  -1.575  0.12782
## Ti.Al        3.666e+02  1.213e+02   3.021  0.00574 **
## Si.Al        1.356e+00  9.858e-01   1.375  0.18118
## P.Al        -9.357e+01  1.831e+02  -0.511  0.61378
## Ni.Al        6.826e+02  3.105e+03   0.220  0.82779
## Cu.Al       -8.022e+02  4.685e+03  -0.171  0.86543
## U.Al        7.571e+02  1.171e+03   0.646  0.52399
## Mo.Al        1.427e+03  5.107e+02   2.793  0.00986 **
## Fe.Al        2.408e-01  4.410e+00   0.055  0.95689
## Zr.Al       -1.313e+03  8.841e+02  -1.485  0.14994
## Ti.Al:Si.Al -2.897e+01  1.139e+01  -2.543  0.01754 *
## Ti.Al:Ni.Al -1.482e+04  3.625e+04  -0.409  0.68620
## Ti.Al:Cu.Al  3.531e+04  9.399e+04   0.376  0.71033
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.153 on 25 degrees of freedom
## Multiple R-squared:  0.801, Adjusted R-squared:  0.7054
## F-statistic: 8.384 on 12 and 25 DF,  p-value: 4.559e-06
```

```
##
## Call:
## lm(formula = TOC ~ Ti.Al + Si.Al + P.Al + Ni.Al + Cu.Al + U.Al +
##      Mo.Al + Fe.Al + Zr.Al + P.Al:Si.Al + P.Al:Ni.Al + +P.Al:Cu.Al +
##      P.Al:Mo.Al, data = data.raw)
```

```

##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -3.8912 -1.1320 -0.3743  0.5934  8.7770
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -2.698e-01  2.583e+00  -0.104  0.91767
## Ti.Al       9.866e+01  6.406e+01   1.540  0.13665
## Si.Al      -6.152e-01  7.679e-01  -0.801  0.43090
## P.Al       2.453e+02  3.914e+02   0.627  0.53670
## Ni.Al      1.536e+03  1.824e+03   0.842  0.40787
## Cu.Al     -4.227e+02  1.667e+03  -0.254  0.80197
## U.Al       5.028e+03  1.654e+03   3.040  0.00564 **
## Mo.Al      2.437e+03  8.644e+02   2.819  0.00950 **
## Fe.Al     -5.537e+00  3.617e+00  -1.531  0.13888
## Zr.Al     -3.909e+02  8.295e+02  -0.471  0.64168
## Si.Al:P.Al -9.800e+00  8.543e+01  -0.115  0.90963
## P.Al:Ni.Al -7.291e+04  1.720e+05  -0.424  0.67545
## P.Al:Cu.Al  2.480e+05  3.050e+05   0.813  0.42400
## P.Al:Mo.Al -1.505e+05  1.047e+05  -1.437  0.16374
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.657 on 24 degrees of freedom
## Multiple R-squared:  0.8644, Adjusted R-squared:  0.7909
## F-statistic: 11.77 on 13 and 24 DF, p-value: 2.022e-07

##
## Call:
## lm(formula = TOC ~ Ni.Al:Fe.Al + Ni.Al:Mo.Al + Ni.Al:U.Al + Cu.Al:Fe.Al +
##      Cu.Al:Mo.Al + Cu.Al:U.Al + Mo.Al:Fe.Al + Mo.Al:U.Al, data = data.raw)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -6.795 -2.271  0.129  1.236  8.276
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  5.335e+00  9.252e-01   5.766 3.03e-06 ***
## Ni.Al:Fe.Al  1.053e+03  1.056e+03   0.997 0.326935
## Ni.Al:Mo.Al  1.053e+06  2.733e+05   3.851 0.000599 ***
## Ni.Al:U.Al  -4.386e+06  1.115e+06  -3.935 0.000477 ***
## Fe.Al:Cu.Al -1.617e+04  5.057e+03  -3.197 0.003348 **
## Mo.Al:Cu.Al -9.285e+05  3.311e+05  -2.804 0.008912 **
## U.Al:Cu.Al   1.910e+07  4.870e+06   3.922 0.000495 ***
## Fe.Al:Mo.Al  3.204e+03  1.614e+03   1.985 0.056706 .
## Mo.Al:U.Al  -1.877e+06  9.558e+05  -1.964 0.059238 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.548 on 29 degrees of freedom
## Multiple R-squared:  0.7076, Adjusted R-squared:  0.627
## F-statistic: 8.774 on 8 and 29 DF, p-value: 5.164e-06

```

```
##
## Call:
## lm(formula = TOC ~ Ti.Al + Si.Al + P.Al + Ni.Al + Cu.Al + U.Al +
##      Mo.Al + Fe.Al + Zr.Al + Ni.Al:Fe.Al + Ni.Al:Mo.Al + +Ni.Al:U.Al +
##      Cu.Al:Fe.Al + Cu.Al:Mo.Al + Cu.Al:U.Al + Mo.Al:Fe.Al + Mo.Al:U.Al,
##      data = data.raw)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -3.8269 -0.7939 -0.0663  0.7683  4.2258
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  1.806e+00  2.638e+00   0.685 0.501510
## Ti.Al       2.434e+01  5.785e+01   0.421 0.678394
## Si.Al       2.730e-01  3.563e-01   0.766 0.452573
## P.Al       -6.324e+01  1.632e+02  -0.388 0.702445
## Ni.Al      -6.445e+03  3.216e+03  -2.004 0.058762 .
## Cu.Al       9.489e+03  2.716e+03   3.494 0.002289 **
## U.Al       7.084e+03  1.779e+03   3.982 0.000734 ***
## Mo.Al       1.541e+03  1.071e+03   1.438 0.165880
## Fe.Al       1.478e+00  6.011e+00   0.246 0.808309
## Zr.Al      -8.882e+02  6.796e+02  -1.307 0.206037
## Ni.Al:Fe.Al  7.965e+03  3.591e+03   2.218 0.038310 *
## Ni.Al:Mo.Al  1.308e+06  7.198e+05   1.818 0.084123 .
## Ni.Al:U.Al  -2.869e+06  1.229e+06  -2.334 0.030147 *
## Cu.Al:Fe.Al -1.843e+04  6.588e+03  -2.798 0.011106 *
## Cu.Al:Mo.Al -2.516e+06  6.616e+05  -3.802 0.001117 **
## Cu.Al:U.Al  1.302e+07  4.887e+06   2.663 0.014925 *
## Mo.Al:Fe.Al  3.292e+03  1.524e+03   2.161 0.043045 *
## U.Al:Mo.Al  -2.851e+06  9.112e+05  -3.129 0.005285 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.085 on 20 degrees of freedom
## Multiple R-squared:  0.9304, Adjusted R-squared:  0.8712
## F-statistic: 15.73 on 17 and 20 DF, p-value: 4.81e-08
```

```
##
## Call:
## lm(formula = TOC ~ Ti.Al + Si.Al + P.Al + Ni.Al + Cu.Al + U.Al +
##      Mo.Al + Fe.Al + Zr.Al + Ti.Al:Si.Al + Ti.Al:Ni.Al + Ti.Al:Cu.Al +
##      P.Al:Si.Al + P.Al:Ni.Al + +P.Al:Cu.Al + P.Al:Mo.Al + Ni.Al:Fe.Al +
##      Ni.Al:Mo.Al + +Ni.Al:U.Al + Cu.Al:Fe.Al + Cu.Al:Mo.Al + Cu.Al:U.Al +
##      Mo.Al:Fe.Al + Mo.Al:U.Al, data = data.raw)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -4.1735 -0.3063 -0.0136  0.3643  3.5620
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  1.560e+01  1.160e+01   1.345 0.20160
## Ti.Al      -1.845e+02  3.194e+02  -0.578 0.57327
```

```

## Si.Al      -2.413e-01  1.994e+00  -0.121  0.90556
## P.Al       1.519e+03  2.315e+03   0.656  0.52306
## Ni.Al      -1.557e+04  8.073e+03  -1.928  0.07592 .
## Cu.Al      1.856e+04  8.628e+03   2.151  0.05089 .
## U.Al       1.676e+03  3.442e+03   0.487  0.63433
## Mo.Al      2.017e+03  2.438e+03   0.827  0.42297
## Fe.Al     -5.299e+00  9.052e+00  -0.585  0.56833
## Zr.Al     -2.064e+03  1.120e+03  -1.842  0.08834 .
## Ti.Al:Si.Al -3.203e+00  3.559e+01  -0.090  0.92968
## Ti.Al:Ni.Al  2.126e+05  1.151e+05   1.846  0.08776 .
## Ti.Al:Cu.Al -1.914e+05  2.290e+05  -0.836  0.41845
## Si.Al:P.Al   9.405e+01  3.708e+02   0.254  0.80374
## P.Al:Ni.Al  -1.109e+06  9.725e+05  -1.140  0.27484
## P.Al:Cu.Al   1.670e+05  1.073e+06   0.156  0.87864
## P.Al:Mo.Al  -6.211e+04  3.240e+05  -0.192  0.85091
## Ni.Al:Fe.Al  8.445e+03  1.471e+04   0.574  0.57581
## Ni.Al:Mo.Al  1.608e+06  1.557e+06   1.032  0.32075
## Ni.Al:U.Al  -1.909e+06  2.713e+06  -0.704  0.49407
## Cu.Al:Fe.Al -2.070e+04  1.075e+04  -1.927  0.07616 .
## Cu.Al:Mo.Al -3.178e+06  9.774e+05  -3.252  0.00631 **
## Cu.Al:U.Al  2.032e+07  8.798e+06   2.309  0.03800 *
## Mo.Al:Fe.Al  4.435e+03  3.507e+03   1.265  0.22823
## U.Al:Mo.Al  -3.294e+06  1.480e+06  -2.225  0.04441 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.994 on 13 degrees of freedom
## Multiple R-squared:  0.9586, Adjusted R-squared:  0.8822
## F-statistic: 12.55 on 24 and 13 DF, p-value: 1.372e-05

```

Log Data OLS Regressions

```
##  
## Call:  
## lm(formula = TOC ~ Ti.Al + Si.Al + P.Al + Ni.Al + Cu.Al + U.Al +  
##      Mo.Al + Fe.Al + Zr.Al, data = logdata)  
##  
## Residuals:  
##      Min      1Q   Median      3Q      Max   
## -1.42876 -0.31798  0.05116  0.37869  1.19784   
##  
## Coefficients:  
##              Estimate Std. Error t value Pr(>|t|)
```

```

## (Intercept) 16.32927    4.06002    4.022 0.000396 ***
## Ti.Al      2.39374    0.78210    3.061 0.004832 **
## Si.Al     -0.81023    0.44605   -1.816 0.080022 .
## P.Al      -0.07834    0.22810   -0.343 0.733833
## Ni.Al     -0.02696    0.35791   -0.075 0.940498
## Cu.Al      0.31981    0.17694    1.807 0.081441 .
## U.Al       0.41078    0.24488    1.677 0.104577
## Mo.Al      0.45769    0.12608    3.630 0.001122 **
## Fe.Al     -0.44810    0.19866   -2.256 0.032101 *
## Zr.Al     -0.15488    0.10217   -1.516 0.140749
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.7073 on 28 degrees of freedom
## Multiple R-squared:  0.8396, Adjusted R-squared:  0.7881
## F-statistic: 16.29 on 9 and 28 DF,  p-value: 6.241e-09

##
## Call:
## lm(formula = TOC ~ Ti.Al + Si.Al + P.Al + Ni.Al + Cu.Al + U.Al +
##      Mo.Al + Fe.Al + Zr.Al + Ti.Al:Si.Al + Ti.Al:Ni.Al + Ti.Al:Cu.Al,
##      data = logdata)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.9800 -0.3591  0.1302  0.3001  1.1065
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -28.66621    22.19925   -1.291   0.2084
## Ti.Al       -13.81076     8.34253   -1.655   0.1103
## Si.Al        -4.02615     2.60229   -1.547   0.1344
## P.Al        -0.37689     0.25946   -1.453   0.1588
## Ni.Al       -0.29945     2.87633   -0.104   0.9179
## Cu.Al       -6.05699     2.41759   -2.505   0.0191 *
## U.Al         0.71940     0.26216    2.744   0.0111 *
## Mo.Al        0.28204     0.13104    2.152   0.0412 *
## Fe.Al       -0.21368     0.24098   -0.887   0.3837
## Zr.Al       -0.03533     0.10250   -0.345   0.7333
## Ti.Al:Si.Al  -1.17655     0.98187   -1.198   0.2420
## Ti.Al:Ni.Al  -0.17420     1.11271   -0.157   0.8769
## Ti.Al:Cu.Al  -2.19903     0.84927   -2.589   0.0158 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.6381 on 25 degrees of freedom
## Multiple R-squared:  0.8835, Adjusted R-squared:  0.8275
## F-statistic: 15.79 on 12 and 25 DF,  p-value: 8.845e-09

##
## Call:
## lm(formula = TOC ~ Ti.Al + Si.Al + P.Al + Ni.Al + Cu.Al + U.Al +
##      Mo.Al + Fe.Al + Zr.Al + P.Al:Si.Al + P.Al:Ni.Al + +P.Al:Cu.Al +
##      P.Al:Mo.Al, data = logdata)

```

```

##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.43543 -0.23920  0.02639  0.34826  0.94710
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -4.92829    11.86852   -0.415  0.68165
## Ti.Al         1.16732     0.85710    1.362  0.18586
## Si.Al        -0.73745     1.60438   -0.460  0.64990
## P.Al         -3.99747     2.22131   -1.800  0.08451 .
## Ni.Al         1.11167     1.50631    0.738  0.46767
## Cu.Al        -3.58351     1.82678   -1.962  0.06150 .
## U.Al          0.82578     0.27632    2.989  0.00638 **
## Mo.Al         0.39681     0.53689    0.739  0.46702
## Fe.Al         0.03080     0.27394    0.112  0.91142
## Zr.Al        -0.06573     0.10306   -0.638  0.52964
## Si.Al:P.Al   -0.04771     0.34468   -0.138  0.89106
## P.Al:Ni.Al    0.24197     0.30231    0.800  0.43133
## P.Al:Cu.Al   -0.76535     0.35974   -2.127  0.04385 *
## P.Al:Mo.Al    0.02011     0.09856    0.204  0.84003
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.6504 on 24 degrees of freedom
## Multiple R-squared:  0.8837, Adjusted R-squared:  0.8208
## F-statistic: 14.03 on 13 and 24 DF, p-value: 3.551e-08

##
## Call:
## lm(formula = TOC ~ Ni.Al:Fe.Al + Ni.Al:Mo.Al + Ni.Al:U.Al + Cu.Al:Fe.Al +
##      Cu.Al:Mo.Al + Cu.Al:U.Al + Mo.Al:Fe.Al + Mo.Al:U.Al, data = logdata)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.62467 -0.25347  0.00995  0.34938  1.05957
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   5.00142     0.84585   5.913 2.02e-06 ***
## Ni.Al:Fe.Al    0.02935     0.34411    0.085  0.93261
## Ni.Al:Mo.Al    0.14014     0.22948    0.611  0.54617
## Ni.Al:U.Al   -0.10752     0.20665   -0.520  0.60682
## Fe.Al:Cu.Al   -0.15837     0.16767   -0.945  0.35271
## Mo.Al:Cu.Al   -0.14278     0.19967   -0.715  0.48029
## U.Al:Cu.Al    0.11895     0.16509    0.721  0.47697
## Fe.Al:Mo.Al    0.18588     0.21771    0.854  0.40019
## Mo.Al:U.Al   -0.07442     0.02688  -2.768  0.00972 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.7328 on 29 degrees of freedom
## Multiple R-squared:  0.8217, Adjusted R-squared:  0.7725
## F-statistic: 16.7 on 8 and 29 DF, p-value: 5.998e-09

```



```
##
## Call:
## lm(formula = TOC ~ Ti.Al + Si.Al + P.Al + Ni.Al + Cu.Al + U.Al +
##      Mo.Al + Fe.Al + Zr.Al + Ni.Al:Fe.Al + Ni.Al:Mo.Al + +Ni.Al:U.Al +
##      Cu.Al:Fe.Al + Cu.Al:Mo.Al + Cu.Al:U.Al + Mo.Al:Fe.Al + Mo.Al:U.Al,
##      data = logdata)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.19740 -0.13795  0.00496  0.18232  0.83879
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -32.021785  13.503010  -2.371  0.0279 *
## Ti.Al       -0.579847   1.029976  -0.563  0.5797
## Si.Al        0.505413   0.532450   0.949  0.3538
## P.Al         0.116304   0.232111   0.501  0.6218
## Ni.Al       -1.388891   2.481107  -0.560  0.5818
## Cu.Al       -3.163064   3.056488  -1.035  0.3131
## U.Al       -3.517398   1.769752  -1.988  0.0607 .
## Mo.Al       -2.986728   2.322039  -1.286  0.2130
## Fe.Al        4.426046   2.920335   1.516  0.1453
## Zr.Al        0.154103   0.115557   1.334  0.1973
## Ni.Al:Fe.Al  0.608028   0.415079   1.465  0.1585
## Ni.Al:Mo.Al -0.008776   0.360510  -0.024  0.9808
## Ni.Al:U.Al  -0.249532   0.447829  -0.557  0.5836
## Cu.Al:Fe.Al  0.080041   0.249837   0.320  0.7520
## Cu.Al:Mo.Al -0.315097   0.239414  -1.316  0.2030
## Cu.Al:U.Al  -0.230423   0.511305  -0.451  0.6571
## Mo.Al:Fe.Al -0.009398   0.186169  -0.050  0.9602
## U.Al:Mo.Al  -0.091740   0.116342  -0.789  0.4396
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.5692 on 20 degrees of freedom
## Multiple R-squared:  0.9258, Adjusted R-squared:  0.8628
## F-statistic: 14.68 on 17 and 20 DF, p-value: 8.811e-08

##
## Call:
## lm(formula = TOC ~ Ti.Al + Si.Al + P.Al + Ni.Al + Cu.Al + U.Al +
##      Mo.Al + Fe.Al + Zr.Al + Ti.Al:Si.Al + Ti.Al:Ni.Al + Ti.Al:Cu.Al +
##      P.Al:Si.Al + P.Al:Ni.Al + +P.Al:Cu.Al + P.Al:Mo.Al + Ni.Al:Fe.Al +
##      Ni.Al:Mo.Al + +Ni.Al:U.Al + Cu.Al:Fe.Al + Cu.Al:Mo.Al + Cu.Al:U.Al +
##      Mo.Al:Fe.Al + Mo.Al:U.Al, data = logdata)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.98910 -0.17890 -0.02681  0.25393  0.78108
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -74.74896   62.09504  -1.204   0.250
## Ti.Al       -7.37229   29.28321  -0.252   0.805
```

## Si.Al	1.06391	5.28711	0.201	0.844
## P.Al	-1.16253	11.71242	-0.099	0.922
## Ni.Al	-8.84545	10.14702	-0.872	0.399
## Cu.Al	-2.51421	4.73737	-0.531	0.605
## U.Al	-6.56093	6.10760	-1.074	0.302
## Mo.Al	-2.00577	3.57118	-0.562	0.584
## Fe.Al	4.14155	5.90540	0.701	0.495
## Zr.Al	0.17258	0.22846	0.755	0.463
## Ti.Al:Si.Al	-1.58830	2.39858	-0.662	0.519
## Ti.Al:Ni.Al	-1.72886	5.31225	-0.325	0.750
## Ti.Al:Cu.Al	0.27306	2.09560	0.130	0.898
## Si.Al:P.Al	1.00462	0.97668	1.029	0.322
## P.Al:Ni.Al	0.40390	2.05648	0.196	0.847
## P.Al:Cu.Al	-0.32392	0.72500	-0.447	0.662
## P.Al:Mo.Al	-0.05233	0.20400	-0.257	0.802
## Ni.Al:Fe.Al	0.48014	0.74104	0.648	0.528
## Ni.Al:Mo.Al	0.10800	0.52082	0.207	0.839
## Ni.Al:U.Al	-0.94142	1.04394	-0.902	0.384
## Cu.Al:Fe.Al	0.08637	0.49871	0.173	0.865
## Cu.Al:Mo.Al	-0.28762	0.29820	-0.965	0.352
## Cu.Al:U.Al	-0.05032	0.73876	-0.068	0.947
## Mo.Al:Fe.Al	0.04032	0.34050	0.118	0.908
## U.Al:Mo.Al	-0.06379	0.22458	-0.284	0.781
##				
## Residual standard error:	0.6046	on 13 degrees of freedom		
## Multiple R-squared:	0.9456	Adjusted R-squared:	0.8451	
## F-statistic:	9.412	on 24 and 13 DF,	p-value:	7.162e-05

Tukey OLS Regressions

```
##  
## Call:  
## lm(formula = TOC ~ Ti.Al + Si.Al + P.Al + Ni.Al + Cu.Al + U.Al +  
##      Mo.Al + Fe.Al + Zr.Al, data = Tdata)  
##  
## Residuals:  
##      Min      1Q  Median      3Q      Max   
## -3.9332 -1.5067 -0.1048  0.9975  5.5693   
##  
## Coefficients:  
##              Estimate Std. Error t value Pr(>|t|)
```

```
## (Intercept) 119.94544 47.79131 2.510 0.0181 *
## Ti.Al 84.60967 35.72161 2.369 0.0250 *
## Si.Al -16.78845 8.66835 -1.937 0.0629 .
## P.Al 4.13897 15.00768 0.276 0.7847
## Ni.Al 0.25731 0.25428 1.012 0.3202
## Cu.Al 0.03880 0.01904 2.038 0.0511 .
## U.Al 3.31083 3.28439 1.008 0.3221
## Mo.Al 35.48756 14.56248 2.437 0.0214 *
## Fe.Al -8.73844 3.30838 -2.641 0.0134 *
## Zr.Al -222.19370 132.48174 -1.677 0.1046
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.589 on 28 degrees of freedom
## Multiple R-squared: 0.7984, Adjusted R-squared: 0.7336
## F-statistic: 12.32 on 9 and 28 DF, p-value: 1.308e-07
```

```
##
## Call:
## lm(formula = TOC ~ Ti.Al + Si.Al + P.Al + Ni.Al + Cu.Al + U.Al +
## Mo.Al + Fe.Al + Zr.Al + Ti.Al:Si.Al + Ti.Al:Ni.Al + Ti.Al:Cu.Al,
## data = Tdata)
```

```
##
## Residuals:
## Min 1Q Median 3Q Max
## -4.4569 -0.9101 0.1436 0.8227 4.3380
##
```

```
## Coefficients:
## Estimate Std. Error t value Pr(>|t|)
## (Intercept) -289.7447 197.5697 -1.467 0.1550
## Ti.Al -251.7632 161.8894 -1.555 0.1325
## Si.Al -438.4639 237.0328 -1.850 0.0762 .
## P.Al -12.7102 17.5608 -0.724 0.4759
## Ni.Al 0.3716 9.9343 0.037 0.9705
## Cu.Al -1.6260 1.0166 -1.600 0.1223
## U.Al 3.4436 3.2088 1.073 0.2934
## Mo.Al 28.5199 14.2126 2.007 0.0557 .
## Fe.Al -3.4874 4.3281 -0.806 0.4280
## Zr.Al -86.2037 140.0191 -0.616 0.5437
## Ti.Al:Si.Al -346.8865 194.3508 -1.785 0.0864 .
## Ti.Al:Ni.Al 0.1311 8.1045 0.016 0.9872
## Ti.Al:Cu.Al -1.3460 0.8273 -1.627 0.1163
```

```
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.429 on 25 degrees of freedom
## Multiple R-squared: 0.8415, Adjusted R-squared: 0.7654
## F-statistic: 11.06 on 12 and 25 DF, p-value: 3.31e-07
```

```
##
## Call:
## lm(formula = TOC ~ Ti.Al + Si.Al + P.Al + Ni.Al + Cu.Al + U.Al +
## Mo.Al + Fe.Al + Zr.Al + P.Al:Si.Al + P.Al:Ni.Al + P.Al:Cu.Al +
## P.Al:Mo.Al, data = Tdata)
```

```
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -4.5032 -0.7749 -0.0688  0.7405  4.8569
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   32.7951    64.6055   0.508  0.6164
## Ti.Al        -40.2347    48.1313  -0.836  0.4114
## Si.Al         70.3984    34.4714   2.042  0.0523 .
## P.Al        -144.1554    85.8632  -1.679  0.1061
## Ni.Al         -0.1040     0.9572  -0.109  0.9144
## Cu.Al          0.1496     0.1653   0.905  0.3746
## U.Al          7.1048     3.0751   2.310  0.0298 *
## Mo.Al         2.5875    77.1672   0.034  0.9735
## Fe.Al        -0.4140     3.8939  -0.106  0.9162
## Zr.Al        142.0889   157.6027   0.902  0.3762
## Si.Al:P.Al  -184.9968    80.9301  -2.286  0.0314 *
## P.Al:Ni.Al    0.7122     2.6310   0.271  0.7889
## P.Al:Cu.Al   -0.2929     0.4409  -0.664  0.5127
## P.Al:Mo.Al    40.4268   200.5721   0.202  0.8420
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.243 on 24 degrees of freedom
## Multiple R-squared:  0.8702, Adjusted R-squared:  0.7999
## F-statistic: 12.38 on 13 and 24 DF, p-value: 1.232e-07

##
## Call:
## lm(formula = TOC ~ Ni.Al:Fe.Al + Ni.Al:Mo.Al + Ni.Al:U.Al + Cu.Al:Fe.Al +
##      Cu.Al:Mo.Al + Cu.Al:U.Al + Mo.Al:Fe.Al + Mo.Al:U.Al, data = Tdata)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -3.8113 -1.7524 -0.1944  1.2636  4.5922
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   15.90814    4.71059   3.377  0.0021 **
## Ni.Al:Fe.Al    0.30509    0.38321   0.796  0.4324
## Ni.Al:Mo.Al   -3.91379    1.91873  -2.040  0.0506 .
## Ni.Al:U.Al    -0.16847    0.11901  -1.416  0.1676
## Fe.Al:Cu.Al   -0.03400    0.06305  -0.539  0.5938
## Mo.Al:Cu.Al    0.06007    0.24261   0.248  0.8062
## U.Al:Cu.Al    -0.02610    0.02302  -1.134  0.2661
## Fe.Al:Mo.Al  -25.68800   13.08281  -1.963  0.0592 .
## Mo.Al:U.Al     1.14899     9.74982   0.118  0.9070
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.41 on 29 degrees of freedom
## Multiple R-squared:  0.8191, Adjusted R-squared:  0.7692
## F-statistic: 16.41 on 8 and 29 DF, p-value: 7.314e-09
```

```
##
## Call:
## lm(formula = TOC ~ Ti.Al + Si.Al + P.Al + Ni.Al + Cu.Al + U.Al +
##      Mo.Al + Fe.Al + Zr.Al + Ni.Al:Fe.Al + Ni.Al:Mo.Al + Ni.Al:U.Al +
##      Cu.Al:Fe.Al + Cu.Al:Mo.Al + Cu.Al:U.Al + Mo.Al:Fe.Al + Mo.Al:U.Al,
##      data = Tdata)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -4.0569 -0.9697  0.0814  0.7106  5.5251
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -46.59428   87.36343  -0.533   0.5997
## Ti.Al         13.00428   55.62766   0.234   0.8175
## Si.Al        -6.33167   10.63429  -0.595   0.5583
## P.Al         -3.80828   18.66256  -0.204   0.8404
## Ni.Al        -7.65981    4.56243  -1.679   0.1087
## Cu.Al         0.11316    0.53234   0.213   0.8338
## U.Al        -23.50945   16.97891  -1.385   0.1814
## Mo.Al        115.76664  138.42057   0.836   0.4128
## Fe.Al        -31.66225   22.49259  -1.408   0.1746
## Zr.Al        -46.13190  160.89203  -0.287   0.7773
## Ni.Al:Fe.Al  -1.12450    0.95947  -1.172   0.2550
## Ni.Al:Mo.Al   12.10619    7.06808   1.713   0.1022
## Ni.Al:U.Al   -2.52764    1.41337  -1.788   0.0889
## Cu.Al:Fe.Al  -0.05255    0.10421  -0.504   0.6196
## Cu.Al:Mo.Al   0.16152    0.62256   0.259   0.7979
## Cu.Al:U.Al    0.02970    0.15917   0.187   0.8538
## Mo.Al:Fe.Al   61.86861   71.58590   0.864   0.3977
## U.Al:Mo.Al  -18.69734   36.87497  -0.507   0.6177
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.21 on 20 degrees of freedom
## Multiple R-squared:  0.895, Adjusted R-squared:  0.8058
## F-statistic: 10.03 on 17 and 20 DF, p-value: 2.259e-06

##
## Call:
## lm(formula = TOC ~ Ti.Al + Si.Al + P.Al + Ni.Al + Cu.Al + U.Al +
##      Mo.Al + Fe.Al + Zr.Al + Ti.Al:Si.Al + Ti.Al:Ni.Al + Ti.Al:Cu.Al +
##      P.Al:Si.Al + P.Al:Ni.Al + P.Al:Cu.Al + P.Al:Mo.Al + Ni.Al:Fe.Al +
##      Ni.Al:Mo.Al + Ni.Al:U.Al + Cu.Al:Fe.Al + Cu.Al:Mo.Al + Cu.Al:U.Al +
##      Mo.Al:Fe.Al + Mo.Al:U.Al, data = Tdata)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -4.2458 -0.7764 -0.0120  0.6402  3.8241
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -157.79802  406.52553  -0.388   0.7042
## Ti.Al        43.63728  242.29778   0.180   0.8599
```

```

## Si.Al      -990.65708  547.56855  -1.809  0.0936 .
## P.Al       287.63815  310.15807   0.927  0.3706
## Ni.Al      43.24703   32.79004   1.319  0.2100
## Cu.Al      -4.44063    2.44129  -1.819  0.0920 .
## U.Al       -53.08097   40.72197  -1.303  0.2150
## Mo.Al      356.26899  360.77956   0.987  0.3414
## Fe.Al     -111.22280   55.90728  -1.989  0.0681 .
## Zr.Al     -380.53197  260.73950  -1.459  0.1682
## Ti.Al:Si.Al -662.69080  404.27963  -1.639  0.1251
## Ti.Al:Ni.Al  43.52036   22.47483   1.936  0.0749 .
## Ti.Al:Cu.Al  -3.88163    1.82017  -2.133  0.0526 .
## Si.Al:P.Al  440.37129  216.20800   2.037  0.0626 .
## P.Al:Ni.Al  -1.91471   14.36923  -0.133  0.8960
## P.Al:Cu.Al  -0.11617    0.89671  -0.130  0.8989
## P.Al:Mo.Al -346.34126  493.80352  -0.701  0.4954
## Ni.Al:Fe.Al  -5.49805    2.89909  -1.896  0.0803 .
## Ni.Al:Mo.Al  14.70359    9.58113   1.535  0.1488
## Ni.Al:U.Al  -4.42085    2.54833  -1.735  0.1064
## Cu.Al:Fe.Al   0.08848    0.16561   0.534  0.6022
## Cu.Al:Mo.Al   0.33981    0.69612   0.488  0.6336
## Cu.Al:U.Al    0.12957    0.18662   0.694  0.4997
## Mo.Al:Fe.Al  221.80923  117.60503   1.886  0.0818 .
## U.Al:Mo.Al   43.78365   78.02234   0.561  0.5842
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.178 on 13 degrees of freedom
## Multiple R-squared:  0.9338, Adjusted R-squared:  0.8114
## F-statistic: 7.635 on 24 and 13 DF, p-value: 0.0002287

```