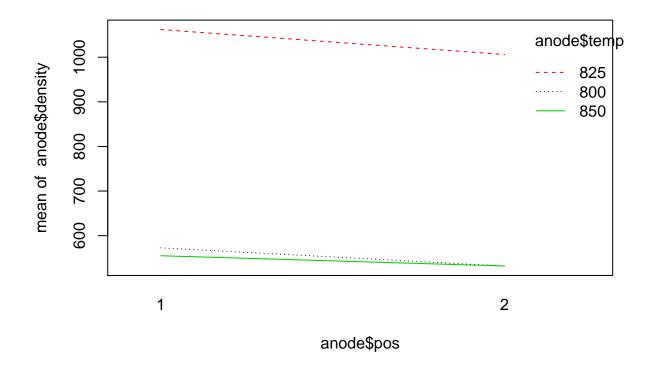
## Q10

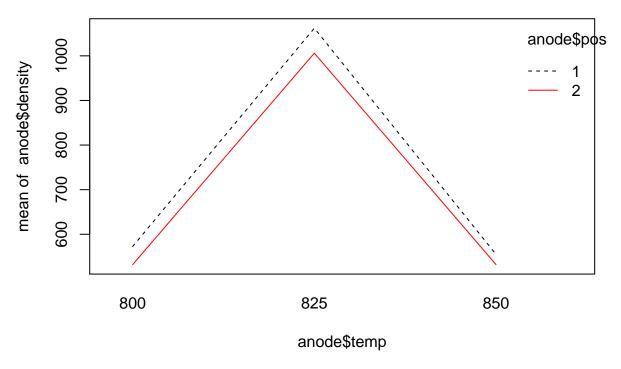
## Zhen Zhang

## 4/25/2020

```
anode = data.frame(
pos = factor(c(rep(1,9), rep(2,9))),
temp = factor(rep(c(rep(800,3), rep(825,3), rep(850,3)), 2)), density = c(570,565,583, 1063,1080,1043,
528,547,521, 988,1026,1004, 526,538,532))
fit = lm(density \sim pos * temp, anode)
summary(fit)
##
## Call:
## lm(formula = density ~ pos * temp, data = anode)
## Residuals:
             1Q Median
     Min
                           3Q
                                 Max
## -45.00 -7.25 -1.00 10.25 35.00
## Coefficients:
##
               Estimate Std. Error t value Pr(>|t|)
                 572.67
                             12.21 46.886 5.79e-15 ***
## (Intercept)
                             17.27 -2.354
                 -40.67
                                             0.0364 *
## pos2
## temp825
                 489.33
                             17.27 28.329 2.32e-12 ***
## temp850
                 -17.67
                             17.27 -1.023
                                             0.3266
## pos2:temp825
                 -15.33
                             24.43 -0.628
                                             0.5420
                             24.43
                                    0.723
                                             0.4834
## pos2:temp850
                  17.67
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.05 '.' 0.1 ' ' 1
## Residual standard error: 21.16 on 12 degrees of freedom
## Multiple R-squared: 0.9944, Adjusted R-squared: 0.9921
                 426 on 5 and 12 DF, p-value: 4.5e-13
## F-statistic:
drop1(fit, test="F")
## Single term deletions
##
## Model:
## density ~ pos * temp
           Df Sum of Sq
                           RSS
                                  AIC F value Pr(>F)
## <none>
                        5370.7 114.57
## pos:temp 2
                 818.11 6188.8 113.12
                                       0.914 0.4271
```



interaction.plot(anode\$temp, anode\$pos, anode\$density, col = 1:2)



```
fit2 = lm(density \sim pos + temp, anode)
drop1(fit2, test="F")
## Single term deletions
##
## Model:
## density \sim pos + temp
         Df Sum of Sq
                         RSS
                                AIC F value
                                                Pr(>F)
## <none>
                         6189 113.12
                 7160 13349 124.96
                                      16.197 0.001254 **
## pos
           1
                945342 951531 199.76 1069.257 4.924e-16 ***
## temp
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.05 '.' 0.1 ' ' 1
summary(fit2)
##
## lm(formula = density ~ pos + temp, data = anode)
## Residuals:
       Min
                1Q Median
                               ЗQ
                                      Max
## -53.444 -9.361
                    2.000 11.639
## Coefficients:
```

```
Estimate Std. Error t value Pr(>|t|)
## (Intercept) 572.278
                      9.911 57.740 < 2e-16 ***
## pos2
                          9.911 -4.025 0.00125 **
              -39.889
## temp825
              481.667
                        12.139 39.680 8.69e-16 ***
                       12.139 -0.728 0.47880
## temp850
               -8.833
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.05 '.' 0.1 ' ' 1
## Residual standard error: 21.03 on 14 degrees of freedom
## Multiple R-squared: 0.9935, Adjusted R-squared: 0.9922
## F-statistic: 718.2 on 3 and 14 DF, p-value: 1.464e-15
```