Supporting Document

MATLAB code for data fitting into the density correlation

```
load('VE.mat');
load('x.mat');

model=@(p,x)x(:,1).*x(:,2).*(p(1)+p(2).*x(:,4)+p(3).*(x(:,4).^2)+(x(:,1)-
x(:,2)).*(p(4)+p(5).*x(:,4)+p(6).*(x(:,4).^2))+((x(:,1)-
x(:,2)).^2).*(p(7)+p(8).*x(:,4)+p(9).*(x(:,4).^2)))+x(:,2).*x(:,3).*(p(10)+
p(11).*x(:,4)+p(12).*(x(:,4).^2)+(x(:,2)-
x(:,3)).*(p(13)+p(14).*x(:,4)+p(15).*(x(:,4).^2)+((x(:,2)-
x(:,3)).^2).*(p(16)+p(17).*x(:,4)+p(18).*(x(:,4).^2)))+x(:,1).*x(:,3).*(p(1
9)+p(20).*x(:,4)+p(21).*(x(:,4).^2)+(x(:,1)-
x(:,3)).*(p(22)+p(23).*x(:,4)+p(24).*(x(:,4).^2))+((x(:,1)-
x(:,3)).^2).*(p(25)+p(26).*x(:,4)+p(27).*(x(:,4).^2)))

% x=(Xamine1,Xamine2,XH2O,Temperature)

pinitial = rand(1,27);

[beta,R,J,CovB,MSE]=nlinfit(x,VE,model,pinitial);

y=x(:,1).*x(:,2).*(beta(1)+beta(2).*x(:,4)+beta(3).*x(:,4).^2+(x(:,1)-
x(:,2)).*(beta(4)+beta(5).*x(:,4)+beta(6).*x(:,4).^2)+((x(:,1)-
x(:,2)).^2).*(beta(7)+beta(8).*x(:,4)+beta(9).*x(:,4).^2))+x(:,2).*x(:,3).*
(beta(10)+beta(11).*x(:,4)+beta(12).*x(:,4).^2+(x(:,2)-
x(:,3)).*(beta(13)+beta(14).*x(:,4)+beta(15).*x(:,4).^2)+((x(:,2)-
x(:,3)).^2).*(beta(16)+beta(17).*x(:,4)+beta(18).*x(:,4).^2))+x(:,1).*x(:,3
).*(beta(19)+beta(20).*x(:,4)+beta(21).*x(:,4).^2+(x(:,1)-
x(:,3)).*(beta(22)+beta(23).*x(:,4)+beta(24).*x(:,4).^2)+((x(:,1)-
x(:,3)).^2).*(beta(25)+beta(26).*x(:,4)+beta(27).*x(:,4).^2));

plot(x(:,4),VE,x(:,4),y)
```

MATLAB code for data fitting into the viscosity correlation

```
load('GE.mat');
load('x.mat');

model=@(p,x)x(:,1).*x(:,2).*(p(1)+p(2).*x(:,4)+p(3).*x(:,4).^2+(x(:,1)-
x(:,2)).*(p(4)+p(5).*x(:,4)+p(6).*x(:,4).^2)+((x(:,1)-
x(:,2)).^2).*(p(7)+p(8).*x(:,4)+p(9).*x(:,4).^2))+x(:,2).*x(:,3).*(p(10)+p(
11).*x(:,4)+p(12).*x(:,4).^2+(x(:,2)-
x(:,3)).*(p(13)+p(14).*x(:,4)+p(15).*x(:,4).^2)+((x(:,2)-
x(:,3)).^2).*(p(16)+p(17).*x(:,4)+p(18).*x(:,4).^2))+x(:,1).*x(:,3).*(p(19)
+p(20).*x(:,4)+p(21).*x(:,4).^2+(x(:,1)-
x(:,3)).*(p(22)+p(23).*x(:,4)+p(24).*x(:,4).^2)+((x(:,1)-
x(:,3)).^2).*(p(25)+p(26).*x(:,4)+p(27).*x(:,4).^2))

% x=(Xamine1,Xamine2,XH2O,Temperature)

pinitial = rand(1,27);

[beta,R,J,CovB,MSE]=nlinfit(x,GE,model,pinitial);
```

```
y=x(:,1).*x(:,2).*(beta(1)+beta(2).*x(:,4)+beta(3).*x(:,4).^2+(x(:,1)-
x(:,2)).*(beta(4)+beta(5).*x(:,4)+beta(6).*x(:,4).^2)+((x(:,1)-
x(:,2)).^2).*(beta(7)+beta(8).*x(:,4)+beta(9).*x(:,4).^2))+x(:,2).*x(:,3).*
 (beta(10)+beta(11).*x(:,4)+beta(12).*x(:,4).^2+(x(:,2)-
x(:,3)).*(beta(13)+beta(14).*x(:,4)+beta(15).*x(:,4).^2)+((x(:,2)-
x(:,3)).^2).*(beta(16)+beta(17).*x(:,4)+beta(18).*x(:,4).^2))+x(:,1).*x(:,3
).*(beta(19)+beta(20).*x(:,4)+beta(21).*x(:,4).^2+(x(:,1)-
x(:,3)).*(beta(22)+beta(23).*x(:,4)+beta(24).*x(:,4).^2)+((x(:,1)-
x(:,3)).^2).*(beta(25)+beta(26).*x(:,4)+beta(27).*x(:,4).^2));

plot(x(:,4),GE,x(:,4),y)
```