Al-0.1Mg PROCESSING MAP

```
data = readtable('Data 208.xlsx');
data.Properties.VariableNames = {'Strain','Strain Rate','T1','T2','T3','T4','T5','T6'}
```

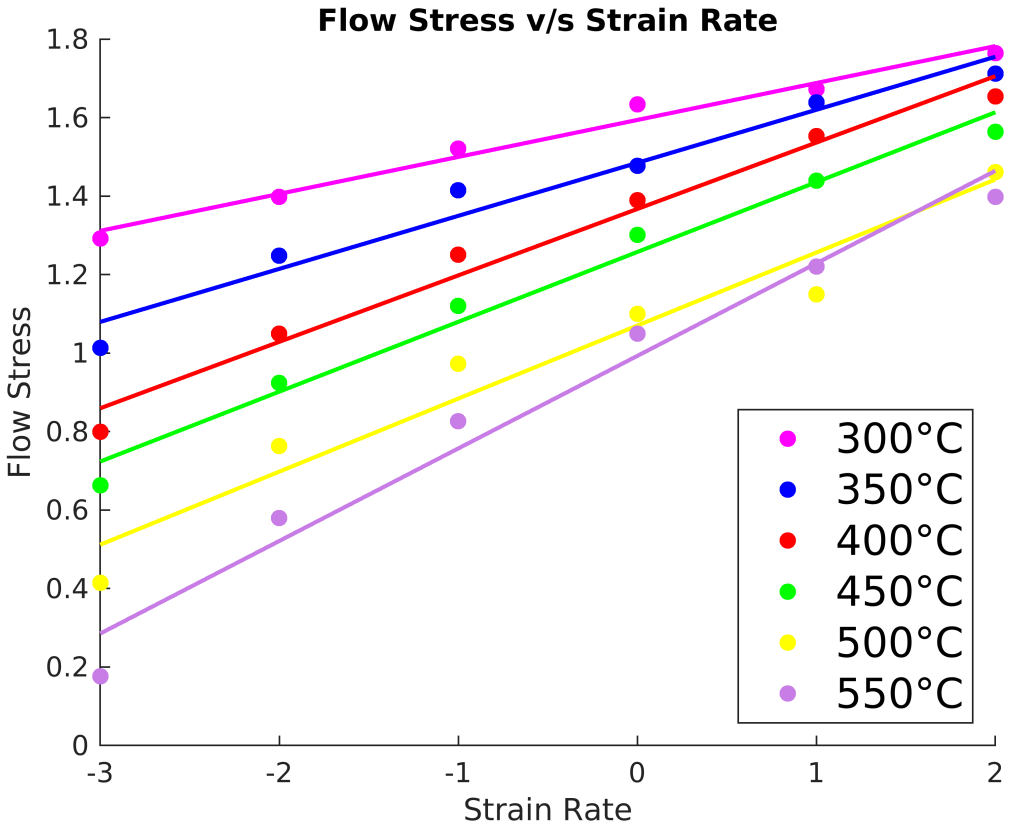
data = 31×8 table

	Strain	Strain Rate	T1	T2	T3	T4	T5	T6
1	NaN	NaN	300.0000	350.0000	400.0000	450.0000	500.0000	550.0000
2	0.1000	0.0010	16.1000	8.8700	5.3000	4.1000	2.2000	1.5200
3	0.1000	0.0100	18.5000	14.1000	9.5000	7.7000	5.3000	3.4200
4	0.1000	0.1000	23.5000	19.0000	13.6000	10.9000	8.1000	6.2000
5	0.1000	1.0000	30.4000	23.0000	17.8000	15.7000	11.5000	9.7000
6	0.1000	10.0000	33.2000	31.0000	25.9000	20.3000	15.8000	13.7000
7	0.1000	100.0000	42.8000	36.1000	31.5000	26.4000	22.0000	19.3000
8	0.2000	0.0010	18.0000	10.1000	6.0000	4.3000	2.4000	1.5200
9	0.2000	0.0100	22.7000	10.9000	10.8000	8.2000	5.6000	3.5600
10	0.2000	0.1000	29.4000	23.2000	16.4000	12.5000	8.9000	6.5600
11	0.2000	1.0000	37.8000	28.3000	22.1000	18.7000	13.3000	10.8000
12	0.2000	10.0000	40.4000	37.8000	31.5000	24.6000	18.6000	15.3000
13	0.2000	100.0000	49.9000	44.8000	39.7000	31.0000	25.8000	22.6000
14	0.3000	0.0010	19.6000	10.3000	6.3000	4.6000	2.6000	1.5000
15	0.3000	0.0100	25.0000	17.7000	11.2000	8.4000	5.8000	3.8000
16	0.3000	0.1000	33.2000	26.0000	17.8000	13.2000	9.4000	6.7000
17	0.3000	1.0000	43.0000	30.0000	24.5000	20.0000	12.6000	11.2000
18	0.3000	10.0000	47.0000	43.5000	35.7000	27.5000	14.1000	16.6000
19	0.3000	100.0000	58.1000	51.5000	45.1000	36.6000	28.9000	25.0000
20	0.4000	0.0010	16.9000	10.5000	6.7000	4.6000	2.9000	1.6000
21	0.4000	0.0100	26.4000	18.1000	11.4000	8.4000	5.9500	3.8000
22	0.4000	0.1000	35.9000	27.5000	17.9000	13.3000	9.3000	6.8000
23	0.4000	1.0000	46.4000	34.2000	25.9000	20.0000	14.3000	11.2000
24	0.4000	10.0000	52.0000	47.5000	37.9000	29.2000	22.0000	17.4000
25	0.4000	100.0000	64.4000	55.7000	46.9000	38.2000	29.6000	26.5000
26	0.5000	0.0010	19.5000	10.5000	6.7000	4.6000	3.2000	1.6000
27	0.5000	0.0100	27.2000	18.1000	11.4000	8.6000	5.8000	3.8000
28	0.5000	0.1000	37.5000	28.0000	18.3000	13.3000	9.3000	6.8000
29	0.5000	1.0000	48.6000	35.4000	26.6000	20.0000	14.5000	11.2000

	Strain	Strain Rate	T1	T2	T3	T4	T5	T6
30	0.5000	10.0000	57.3000	50.0000	39.3000	30.0000	22.4000	17.5000
31	0.5000	100.0000	67.6000	57.4000	47.8000	38.2000	29.3000	26.7000

```
data(1,:)=[];
```

```
datan= table2array(data);
% 0.1 strain
strain_1 = datan(13:18,2:end);
sr1 = strain_1(:,1);
strainlog = log10(sr1);
stress1 = strain_1(:,2:end);y = zeros(6,6);
stresslog = log10(stress1);
C = {'m','b','r','g','y',[.8 .5 .9]};
hold on
for r = 1:length(stress1)
    Scatter(r) =scatter(strainlog,stresslog(:,r),'filled','MarkerFaceColor',C{r});
    c= polyfit(log10(sr1),log10(stress1(:,r)),1);
    y(:,r) = polyval(c,log10(sr1));
    plot(log10(sr1),y(:,r),'LineWidth',1.5,'Color',C{r})
end
ylabel('Flow Stress');xlabel('Strain Rate');
title('Flow Stress v/s Strain Rate')
legend(Scatter,'300°C','350°C','400°C','450°C','500°C','550°C','Location','southeast','
hold off
```



```
fprintf('Coded By: Mudit Vyas IIT INDORE')
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Coded By: Mudit Vyas IIT INDORE
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```
%slope or strain rate sensitivity
m= zeros(length(stress1),length(stress1));
for k =  1:length(stress1)
 for p = 1:length(stress1)
        c1= polyfit(log10(sr1),log10(stress1(:,k)),3);
        deriv = polyder(c1);
        m(p,k) = polyval(deriv,strainlog(p));
 end
end
```

```
e= (2*m./(m+1))*100;
T= 300:50:550;
%instability zone
e1= e/200;
slope= zeros(length(stress1),length(stress1));
for k =  1:length(stress1)
    for p =  1:length(stress1)
        c2= polyfit(log10(sr1),log10(e1(:,k)),3);
        deriv = polyder(c2);
        slope(p,k) = polyval(deriv,strainlog(p));

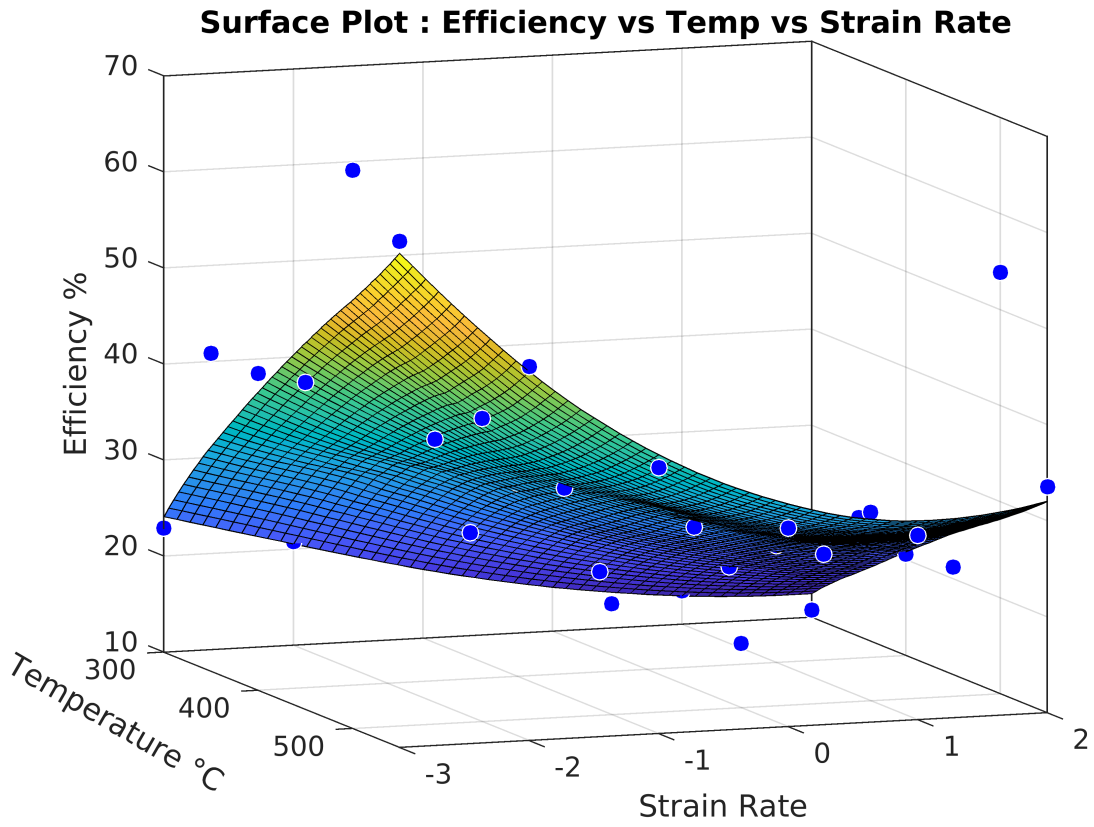
    end
end
iz = slope +m;
```

```
%%surface
%% Fit: 'untitled fit 1'.
[xData, yData, zData] = prepareSurfaceData( T, strainlog, e );
% Set up fittype and options.
ft = fittype( 'loess' );
opts = fitoptions( 'Method', 'LowessFit' );
opts.Normalize = 'on';
opts.Robust = 'Bisquare';
opts.Span = 0.75;

% Fit model to data.
[fitresult, gof] = fit( [xData, yData], zData, ft, opts );

% Make contour plot.
figure( 'Name', 'untitled fit 1' );
h=plot( fitresult, [xData, yData], zData, 'Style', 'Surface' );
% Label axes
xlabel( 'Temperature °C ', 'Interpreter', 'none' );
ylabel( 'Strain Rate', 'Interpreter', 'none' );
zlabel('Efficiency %')
view([70 10]);
```

```
set(get(gca,'xlabel'), 'Rotation',-30);
title('Surface Plot : Efficiency vs Temp vs Strain Rate');
```



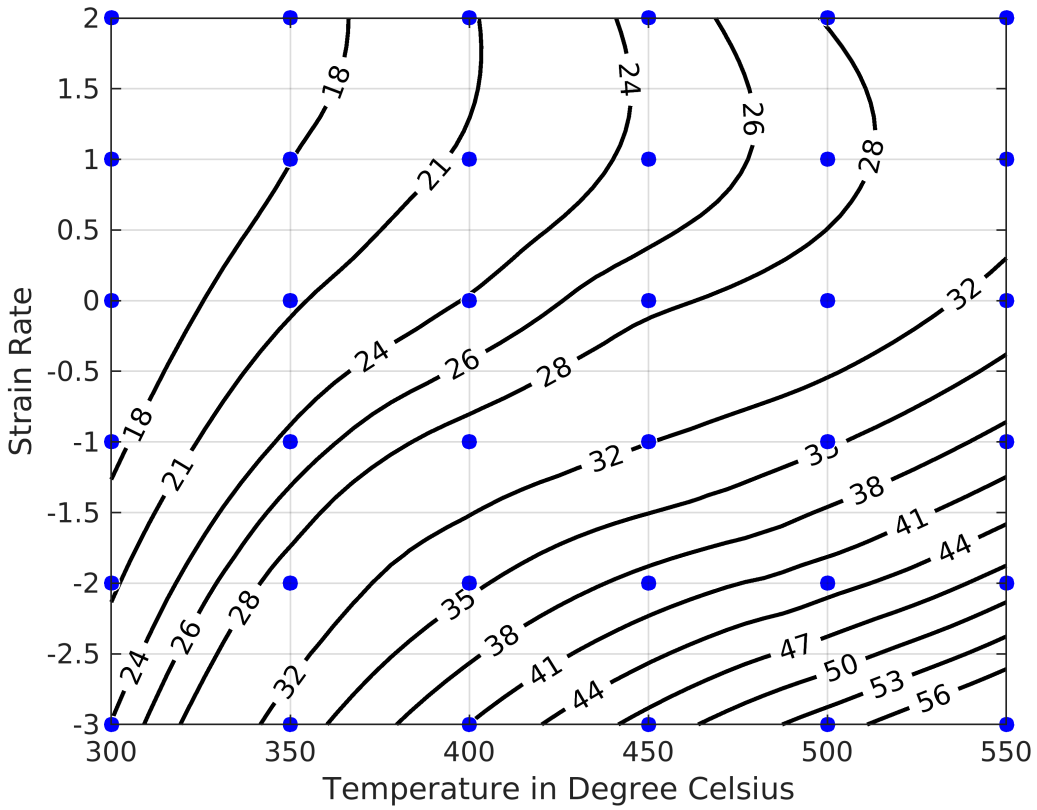

```
%% Fit: 'untitled fit 1'.
[xData, yData, zData] = prepareSurfaceData( T, strainlog, e );
% Set up fittype and options.
ft = fittype( 'loess' );
opts = fitoptions( 'Method', 'LowessFit' );
opts.Normalize = 'on';
opts.Robust = 'Bisquare';
opts.Span = 0.75;

% Fit model to data.
[fitresult, gof] = fit( [xData, yData], zData, ft, opts );

% Make contour plot.
figure( 'Name', 'untitled fit 1' );
h=plot( fitresult, [xData, yData], zData, 'Style', 'Contour' );
% Label axes
xlabel( 'Temperature in Degree Celsius', 'Interpreter', 'none' );
ylabel( 'Strain Rate', 'Interpreter', 'none' );

grid on
set(h(1),'ShowText','on','LabelSpacing',144)
set(h(1),'LineWidth',1.5,'Fill','off');
set(h(1),'LevelList',[18,21,24,26,28,32,35,38,41,44,47,50,53,56])
fig = gcf;
```

```
saveas(gcf,'pd0_1.jpg')
```

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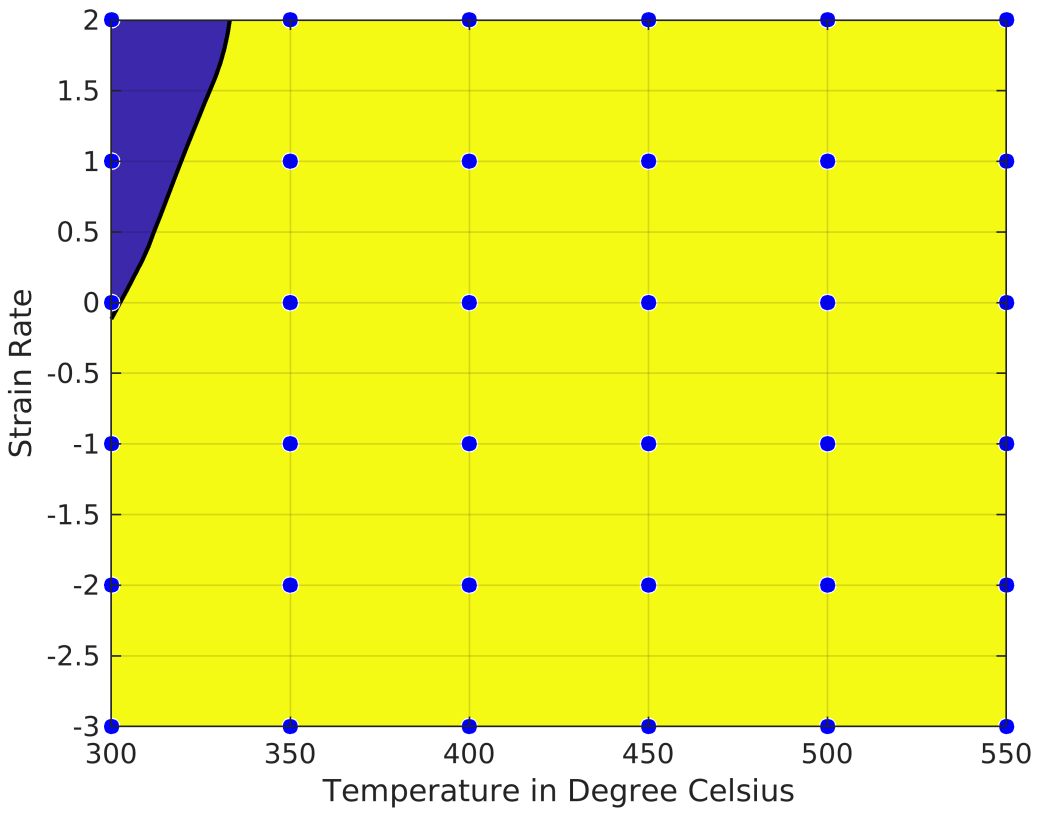
```
%% Fit: Instability map .
[xData, yData, zData] = prepareSurfaceData( T, strainlog, iz );
% Set up fittype and options.
ft = fittype( 'loess' );
opts = fitoptions( 'Method', 'LowessFit' );
opts.Normalize = 'on';
opts.Robust = 'Bisquare';
opts.Span = 0.75;

% Fit model to data.
[fitresult, gof] = fit( [xData, yData], zData, ft, opts );

% Make contour plot.
figure( 'Name', 'untitled fit 1' );
w=plot( fitresult, [xData, yData], zData, 'Style', 'Contour' );
% Label axes
xlabel( 'Temperature in Degree Celsius', 'Interpreter', 'none' );
ylabel( 'Strain Rate', 'Interpreter', 'none' );
grid on
set(w(1),'LineWidth',1.5,'LevelStep',2);
```

```
fig = gcf;
saveas(gcf,'is0_1.jpg')
```

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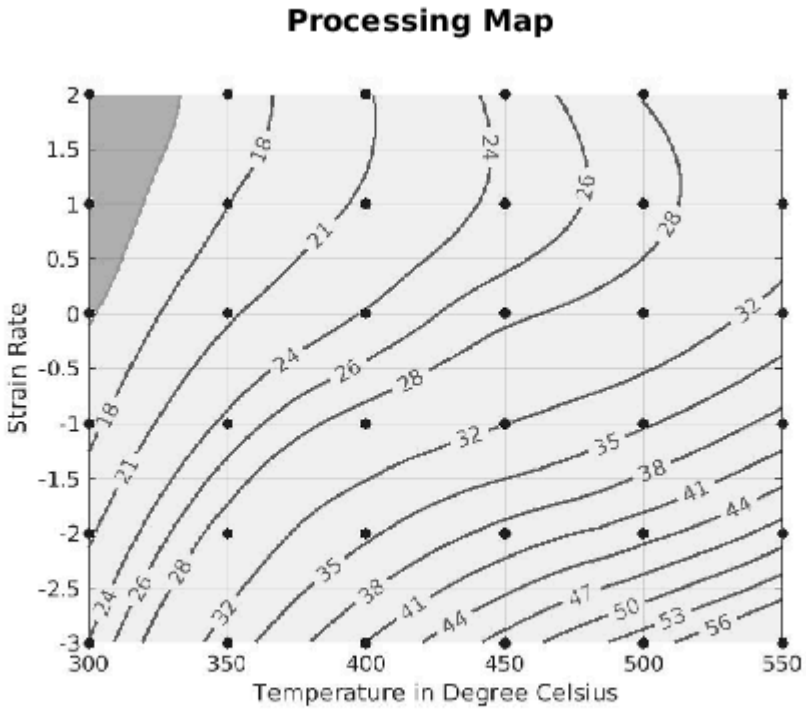
```
%%https://in.mathworks.com/help/curvefit/fit-smooth-surfaces-to-investigate-fuel-effici
```

```
% BASIC IMAGE PROCESSING : SUPERIMPOSE
fig1 = imread('pd0_1.jpg');
fig2 = imread('is0_1.jpg');
fusionimage=imfuse(fig1,fig2,'falsecolor','Scaling','joint');
op=rgb2gray(fusionimage);
op= imresize(op,[1968 2622]);
imshow(op )
title('Processing Map')
```




```
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```

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```