```
response_data_type = {'voltage', 'normal current density', 'anode related'};
%response_data_type = {'voltage', 'Z_CURRENT_DENSITY', 'anode related'};
%calibration_data_type = {'voltage'};
%calibration_data_type = {'voltage', 'current density', 'Z_ELECTRIC_FIELD'};

metric = 'nmsq';

IPs_IDs = 32820:32868;

IPs_IDs1 = IPs_IDs(1:2:end);

IDs_current_density = [14390, 7400, 4060, 16000, 19860, 23802, 30002, 23822,21212, 8437];
%IDs_current_density =[27791       27813       27839       27859];
%IDs_current_density = IPs_IDs1;
anode_related_IDs = 1:2;

IDs = {py.list(IPs_IDs1), py.list(IDs_current_density), py.list(anode_related_IDs)};
IDs_matarr = {IPs_IDs1, IDs_current_density,anode_related_IDs};

%IDs_types = {'Internal Points','Mesh Points', 'Internal Points','CONSUMPTION_FACTOR','ANODE_CU
%IDs_types = {'Internal Points','Mesh Points', 'Internal Points','ANODE_CURRENT'};
IDs_types = {'Internal Points','Mesh Points',  'MASS_LOSS_RATE'};
%
%IDs_types = {'Internal Points','Internal Points', 'MASS_LOSS_RATE'};
%py.list(1:2)
```

```
source_parameters = {'BARE','BARE'};

parameters= {'CA00','CB00'};

%DOE_range1 = [4.0, 10.0; 3, 8.0];
DOE_range1 = [0.005, 0.2; 0.005,  0.15];


%DOE experiment for 2 varaibles using Central Composite Design
Central_composite_points = ccdesign(2, 'type', 'inscribed', 'center' , 1);

DOE_sample_points1 = reverse_normalization(Central_composite_points, DOE_range1);
%DOE_sample_points2 = DOE_sample_points1(1:1.4:end,:);
%DOE_sample_points2 = reverse_normalization(Central_composite_points, DOE_range2);
%DOE_sample_points3 = reverse_normalization(Central_composite_points, DOE_range3);

%DOE_sample_points = [DOE_sample_points ;reverse_normalization(Central_composite_points, DOE_ra
root_folder = 'D:\DOE_nd_data_generation\TIme_step\readyToTimeStepUsingV10_B\year_0';
simulation_seed_folder = fullfile(root_folder, 'Initial_files');
%simulation_seed_folder  = "C:\Users\msapkota\EXPERIMENT\DOE_nd_data_generation\Model_updated_I

collection_dir = fullfile(root_folder, 'Simulation_results');
```

```
%merging_snapshots
```

```
surrogates_0 = response_surface(DOE_sample_points1, snapshots_0,2);
```

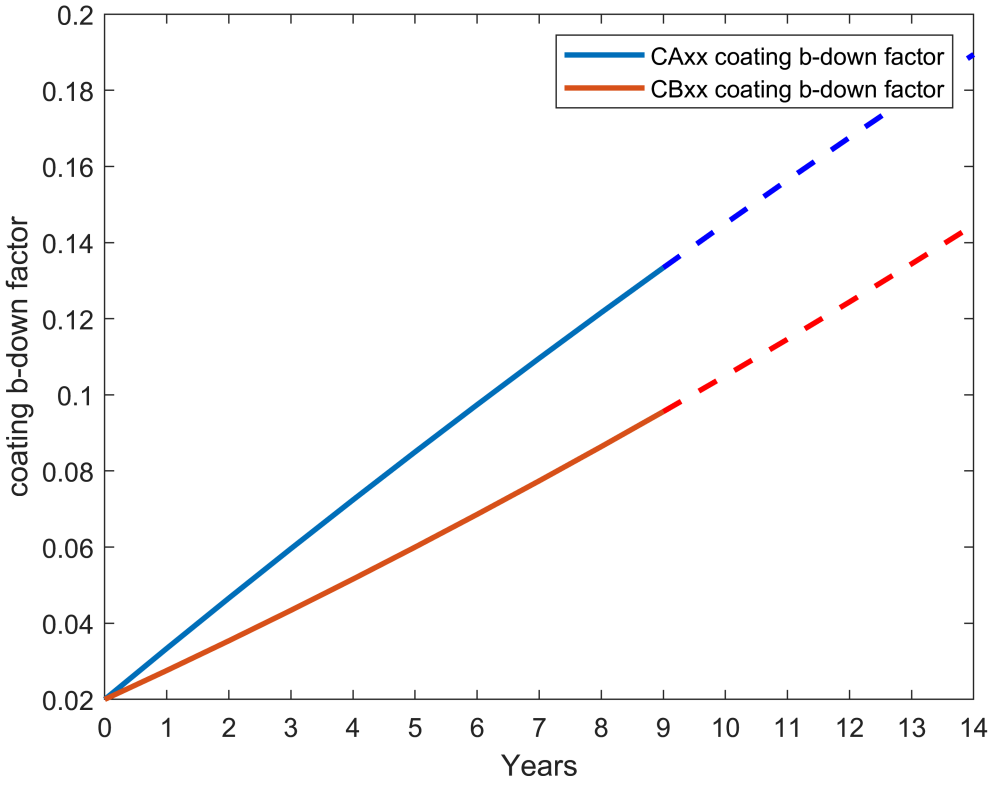
```
surrogates = cell(1,3);
surrogates{1} = surrogates_0;
surrogates{2} = surrogates_5;
surrogates{3} = surrogates_10;
```

```
solution_values = [0.02 0.02; 0.085 0.06; 0.145 0.105];

ft = fittype( 'poly2' );

Fit_2nd_order = cell(1,2);
time_stepes = [0,5,10];
%time_stepes= 1:length(solution_values);

Fit_2nd_order{1,1} = fit( time_stepes.', solution_values(:,1), ft );
Fit_2nd_order{1,2} = fit( time_stepes.', solution_values(:,2), ft );


testing_data= [2*time_stepes(end)-time_stepes(end-1), 0.20, 0.13 ];

predicted_p_value = [Fit_2nd_order{1}(testing_data(1)), Fit_2nd_order{2}(testing_data(1))];
```

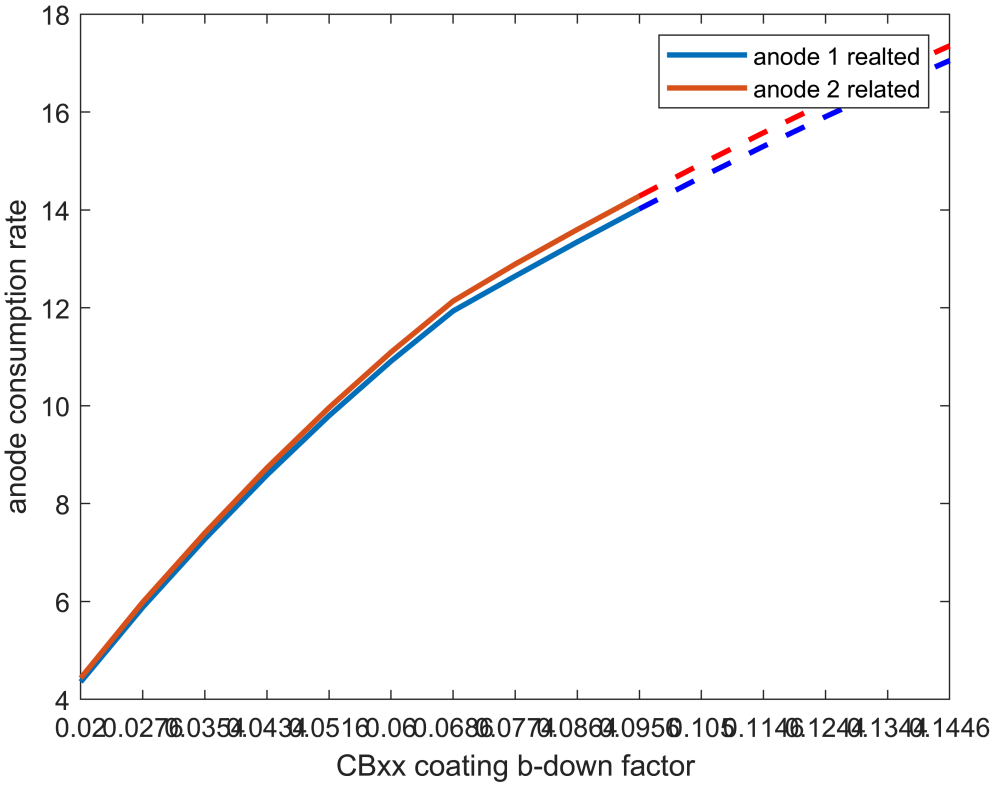
```
p_values_0_14 = zeros(15,2);

anode1_2_consumtions_rate = zeros(15,2);

anode_left_year_wise = zeros(15,2);
years = 0:14;
for i = 1:15
    year = years(i);
    p_val = [Fit_2nd_order{1}(year), Fit_2nd_order{2}(year)];

    p_values_0_14(i,:) = p_val;

    surro_index = min(round(i/5)+1, length(surrogates));
    %{
    if i<8

        surrogate_output = output_from_surrogates(p_val, surrogates_0, [length(IDs{1}), length(

    else
        surrogate_output = output_from_surrogates(p_val, surrogates_10, [length(IDs{1}), length
    end
    %}
    surrogate_output = output_from_surrogates(p_val, surrogates{surro_index}, [length(IDs{1}),

    anode1_2_consumtions_rate(i,:) = surrogate_output{3}.';
```

```
    total_anode_consumed = [sum(anode1_2_consumtions_rate(:,1)), sum(anode1_2_consumtions_rate(

    anode_left_year_wise(i,:) = [356 356]-total_anode_consumed;
end
```

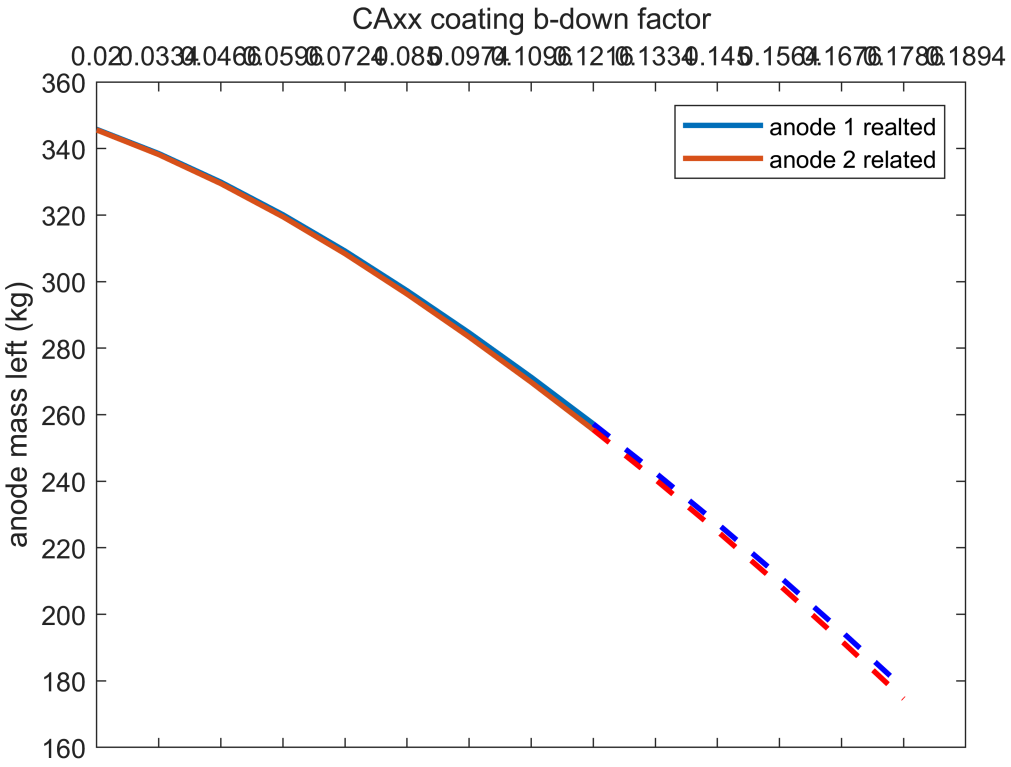
```
figure;

%xticklabels(strsplit(num2str(p_values_0_14(1:10,1).')));
%xticklabels(arrayfun(@num2str, p_values_0_14(1:10,1).', 'UniformOutput', 0));
%xticklabels( cellstrp_values_0_14(1:10,1).');

plot(1:10, p_values_0_14(1:10,1),'LineWidth', 2);
hold on;
plot(1:10, p_values_0_14(1:10,2),'LineWidth', 2);

plot(10:15, p_values_0_14(10:end,1),'LineWidth', 2, 'color' ,'b', 'LineStyle', '--');

plot(10:15, p_values_0_14(10:end,2),'LineWidth', 2, 'color' ,'r', 'LineStyle', '--');

%set(gca,'XAxisLocation','top');

legend( {'CAxx coating b-down factor','CBxx coating b-down factor'});

set(gca, 'Xtick', 1:15);
set(gca, 'XTickLabel', strsplit(num2str(years)));
ylabel('coating b-down factor');
xlabel('Years');
xlim([1,15])
```




```
figure;

%xticklabels(strsplit(num2str(p_values_0_14(1:10,1).')));
%xticklabels(arrayfun(@num2str, p_values_0_14(1:10,1).', 'UniformOutput', 0));
%xticklabels( cellstrp_values_0_14(1:10,1).');

plot(1:10, anode1_2_consumtions_rate(1:10,1),'LineWidth', 2);
hold on;
plot(1:10, anode1_2_consumtions_rate(1:10,2),'LineWidth', 2);

plot(10:15, anode1_2_consumtions_rate(10:end,1),'LineWidth', 2, 'color' ,'b', 'LineStyle', '--'

plot(10:15, anode1_2_consumtions_rate(10:end,2),'LineWidth', 2, 'color' ,'r', 'LineStyle', '--'

%set(gca,'XAxisLocation','top');

legend( {'anode 1 realted','anode 2 related'});

set(gca, 'Xtick', 1:15);
set(gca, 'XTickLabel', strsplit(num2str(p_values_0_14(1:15,2).')));
xlabel('CBxx coating b-down factor');
ylabel('anode consumption rate');
xlim([1,15])
```




```
%anode_left_year_wise = zeros(15,2);

figure;

plot(years(1:10), anode_left_year_wise(1:10,1),'LineWidth', 2);

hold on;


plot(years(1:10), anode_left_year_wise(1:10,2),'LineWidth', 2);

plot(years(10:end), anode_left_year_wise(10:end,1),'LineWidth', 2, 'color' ,'b', 'LineStyle', '

plot(years(10:end), anode_left_year_wise(10:end,2),'LineWidth', 2, 'color' ,'r', 'LineStyle', '


legend({'anode 1 realted','anode 2 related'});

set(gca,'XAxisLocation','top');
set(gca, 'Xtick', 1:15);
set(gca, 'XTickLabel', strsplit(num2str(p_values_0_14(1:15,1).')));
xlabel('CAxx coating b-down factor');
ylabel('anode mass left (kg)');
xlim([1,15])
```


CAxx coating b-down factor
0.02
0.0334
0.0466
0.0596
0.0724
0.085
0.0974
0.1096
0.1216
0.1334
0.145
0.1563
0.1676
0.1786
0.1894
360
340
320
300
280
260
240
220
200
180
160
anode mass left (kg)
anode 1 realted
anode 2 related