Progress on Stress Analysis of Positron Source Target by AWB Simulation

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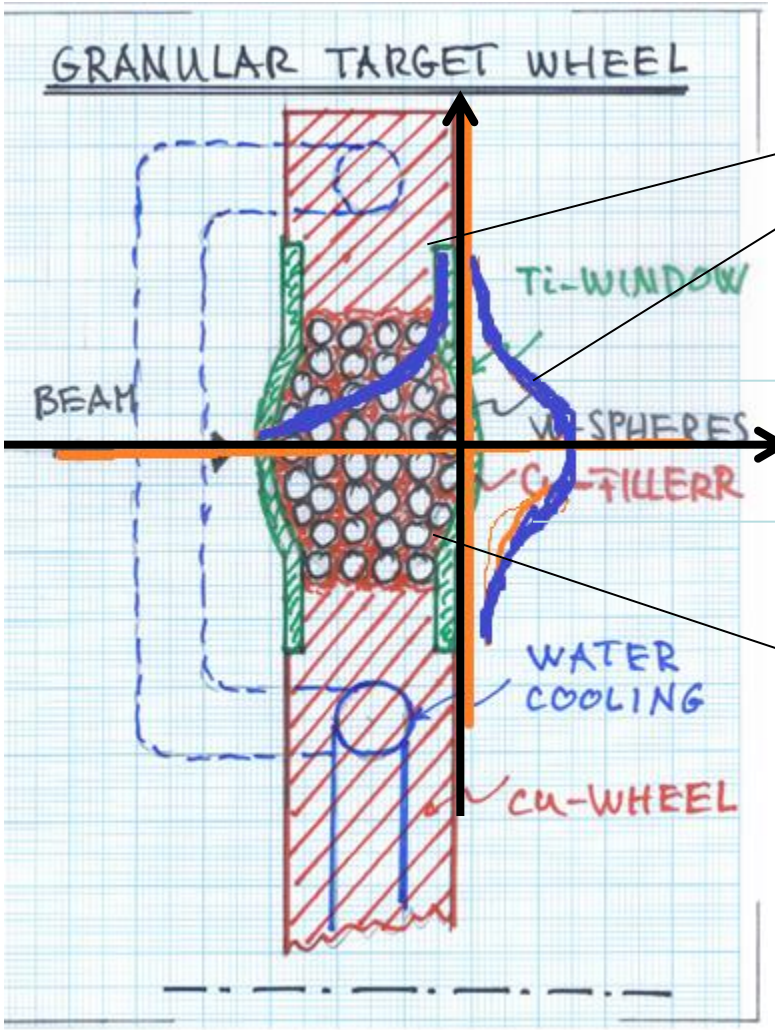
Background

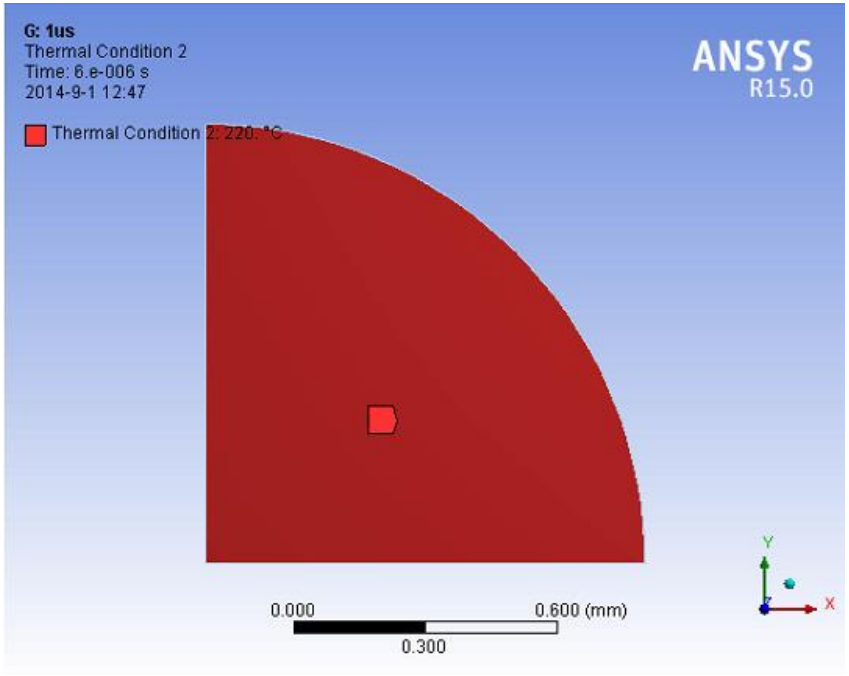


PEDD: 30J/g
（Temperature :220K）

Width：8mm

- Diameter：2mm

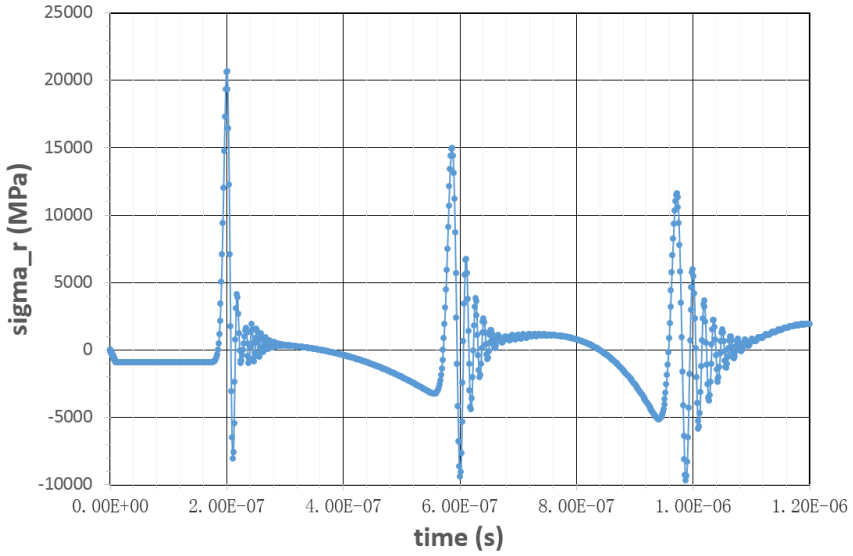
Model

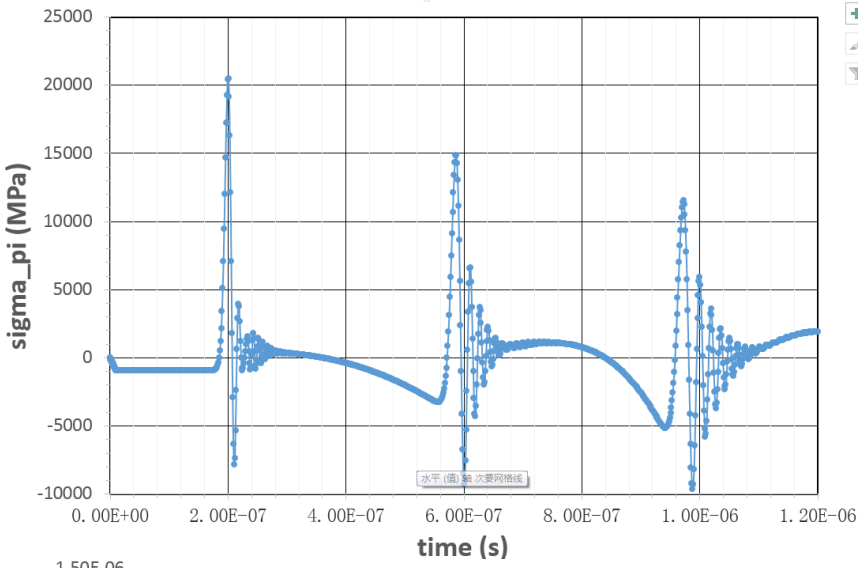


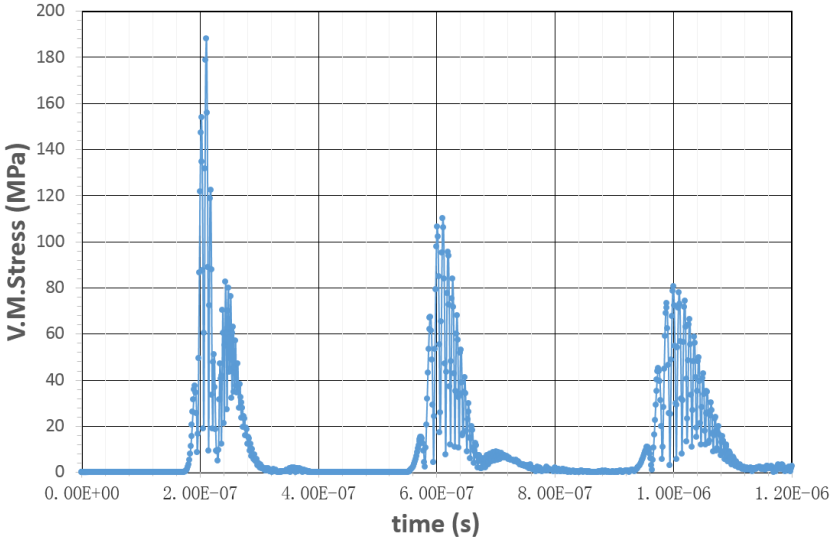
1. Temperature is uniform in the volume; it is 220K after heating;
2. Diameter is 2mm;

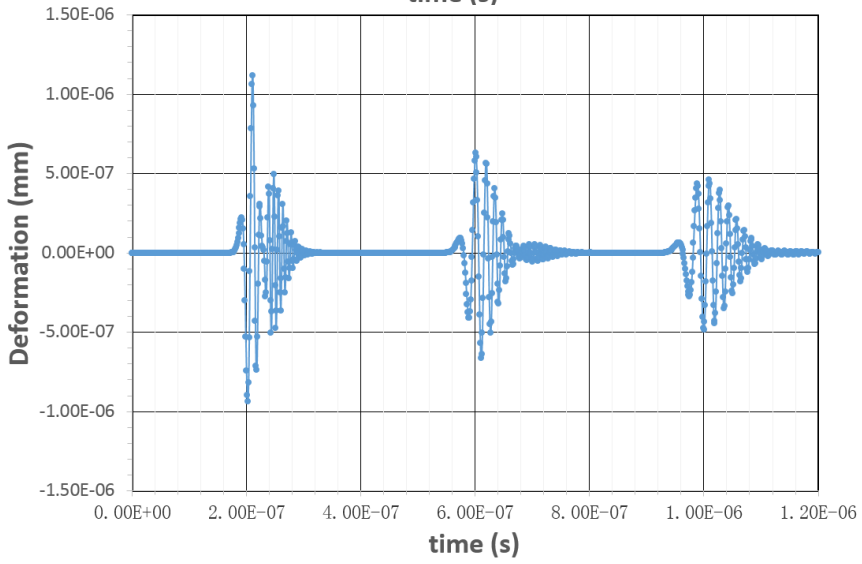
- Three cases are simulated
  - Heating time 10ns;
  - Heating time 100ns;
  - Heating time is 1us;
- Two points are analyzed:
  - At the center;
  - At the boundary;

10ns heating time, at center

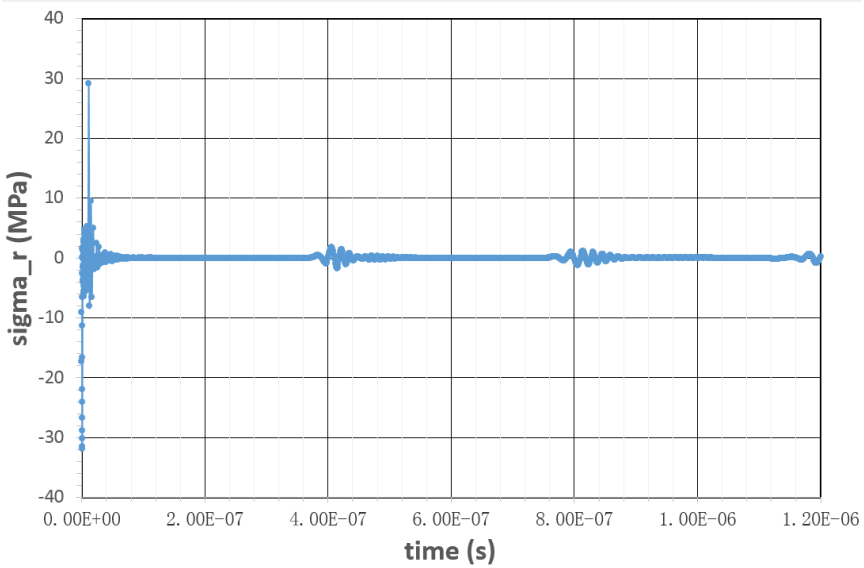


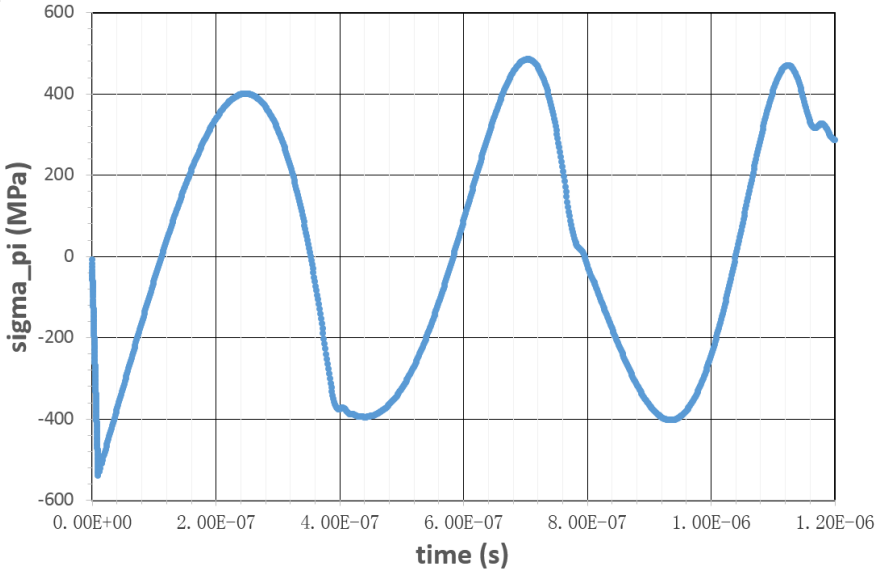


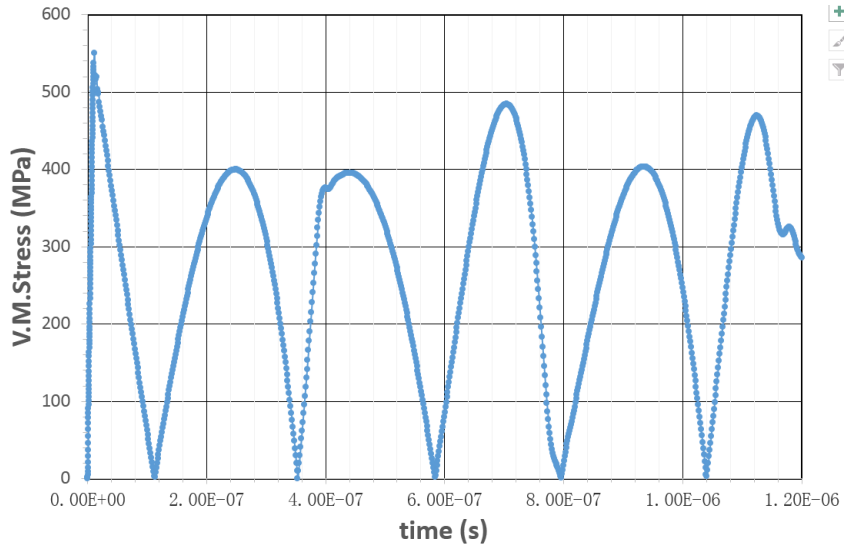


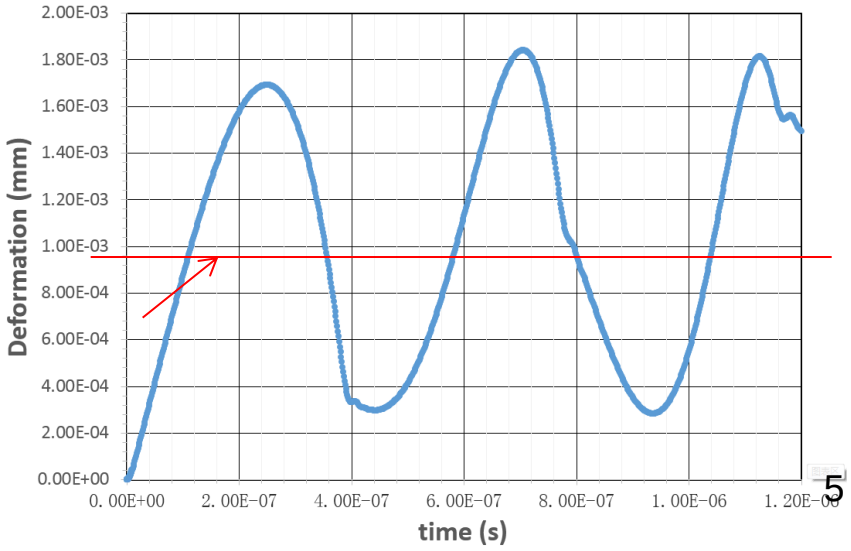


10ns heating time, at edge

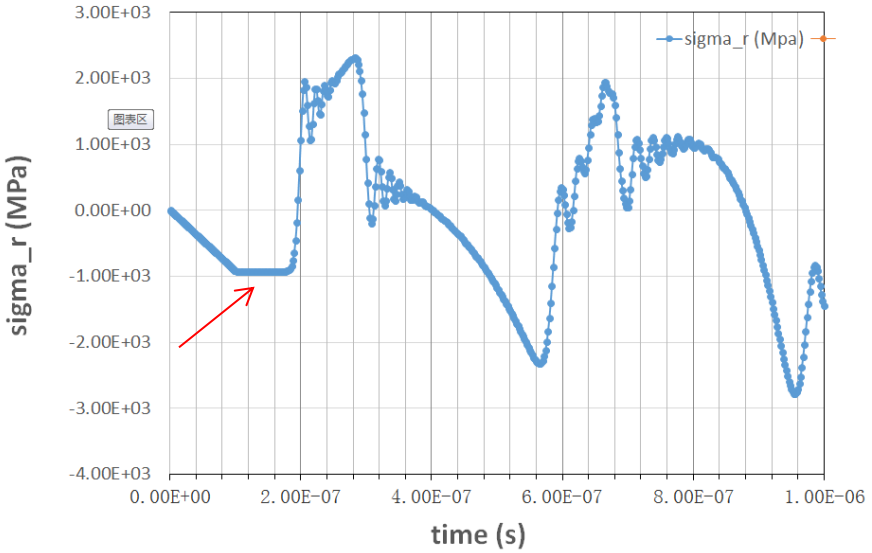


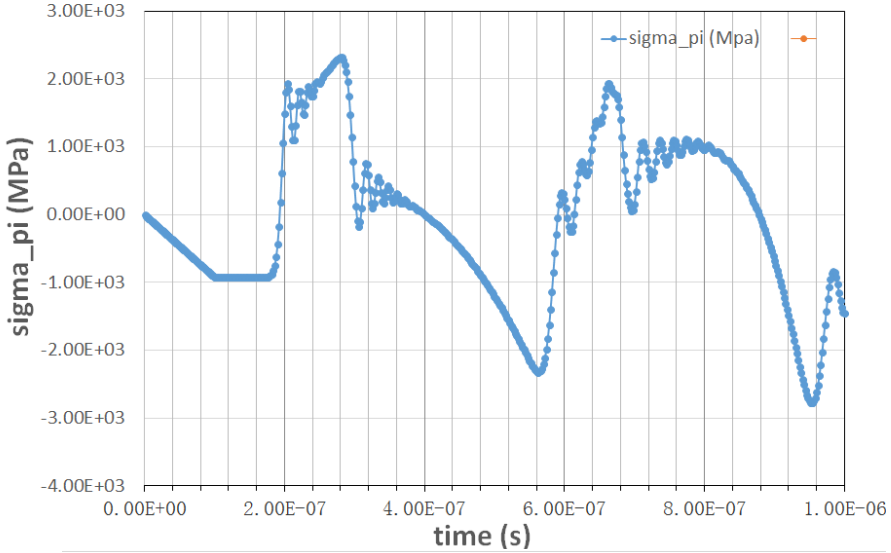


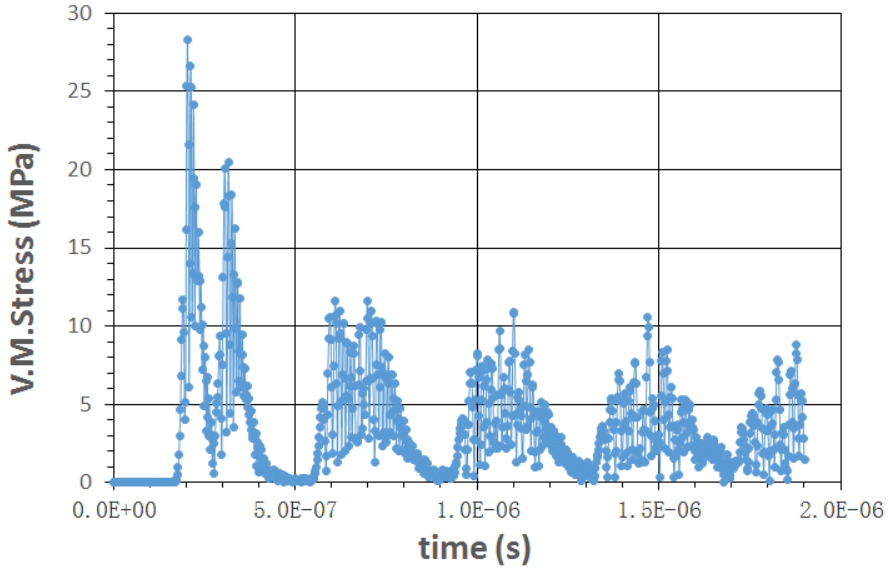


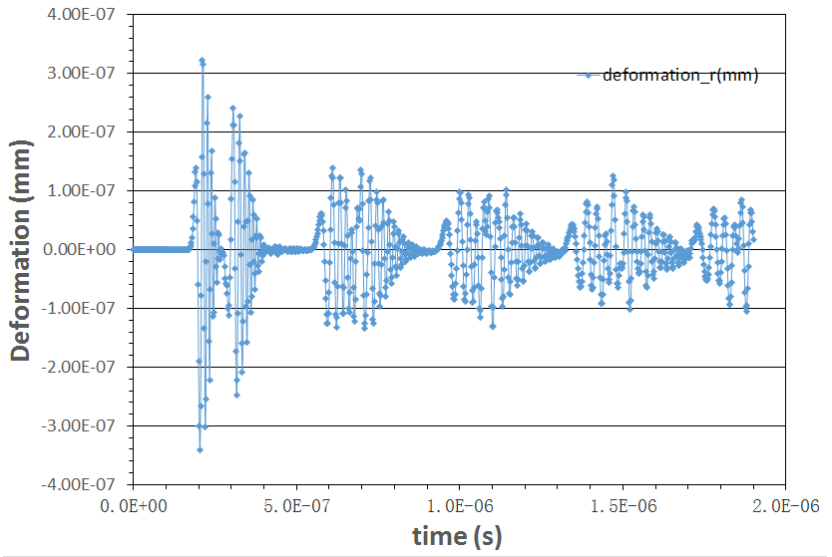


100ns heating time, at center

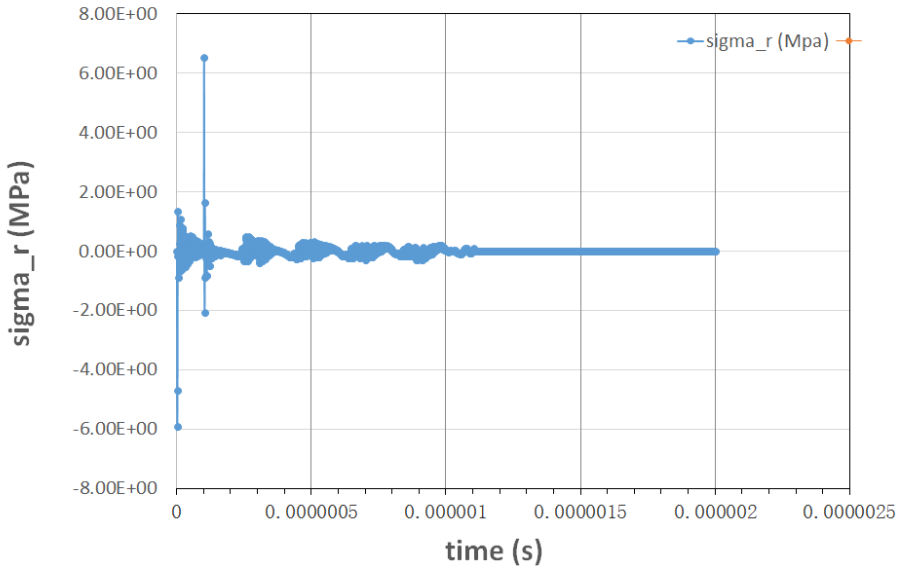


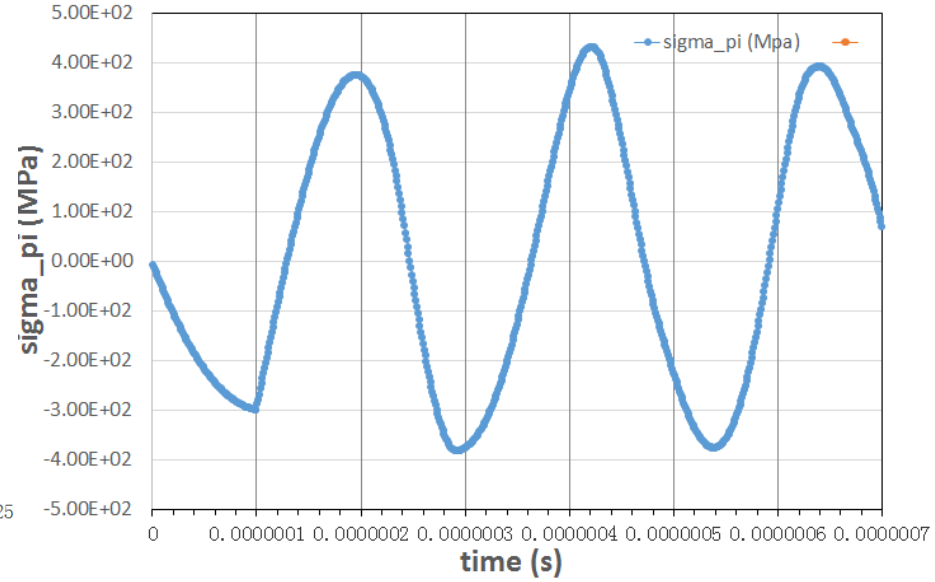


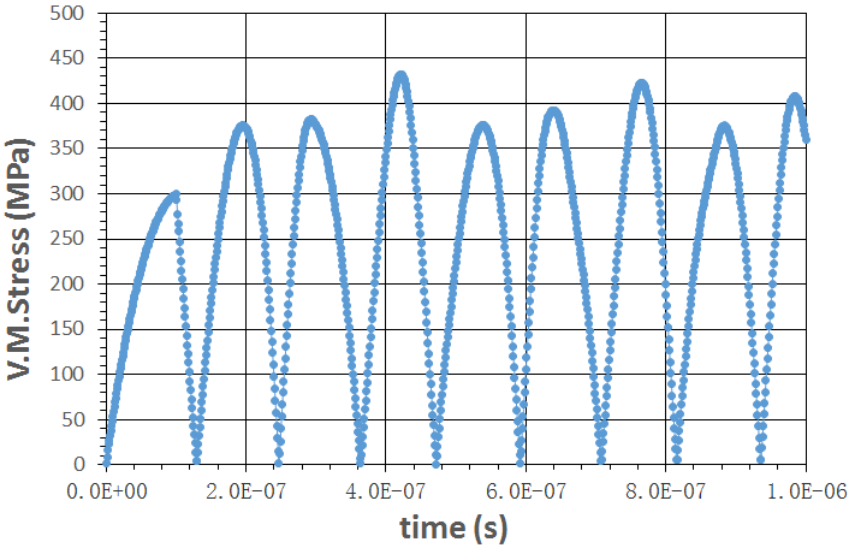


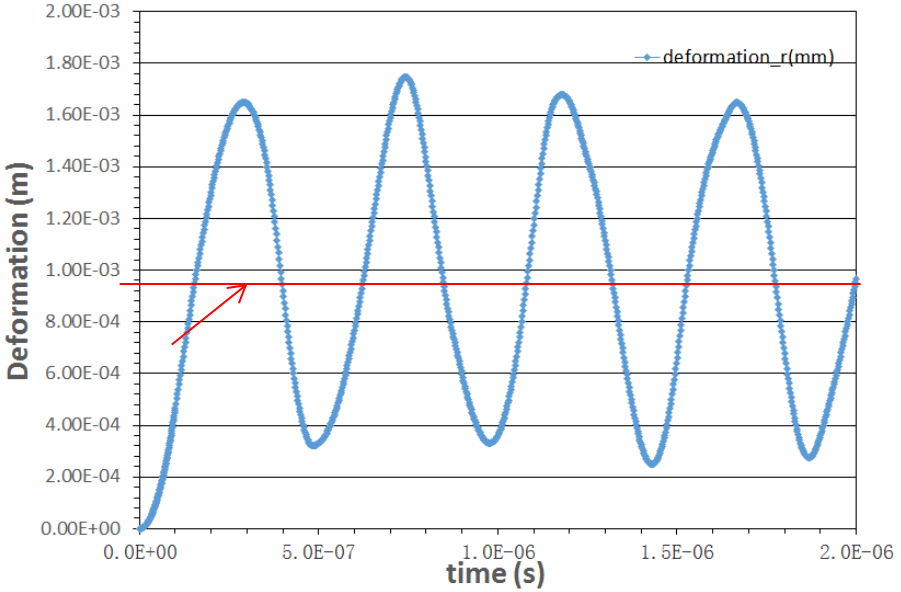


100ns heating time, at edge

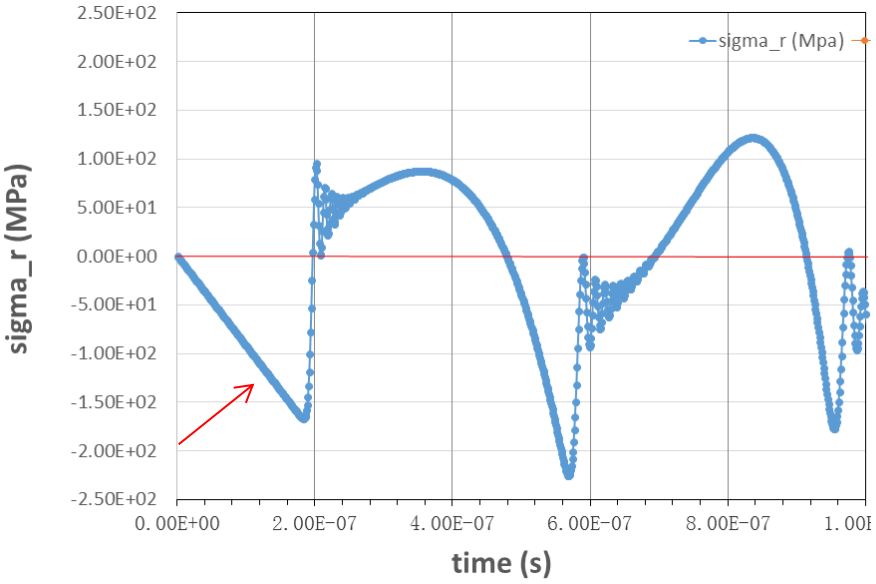


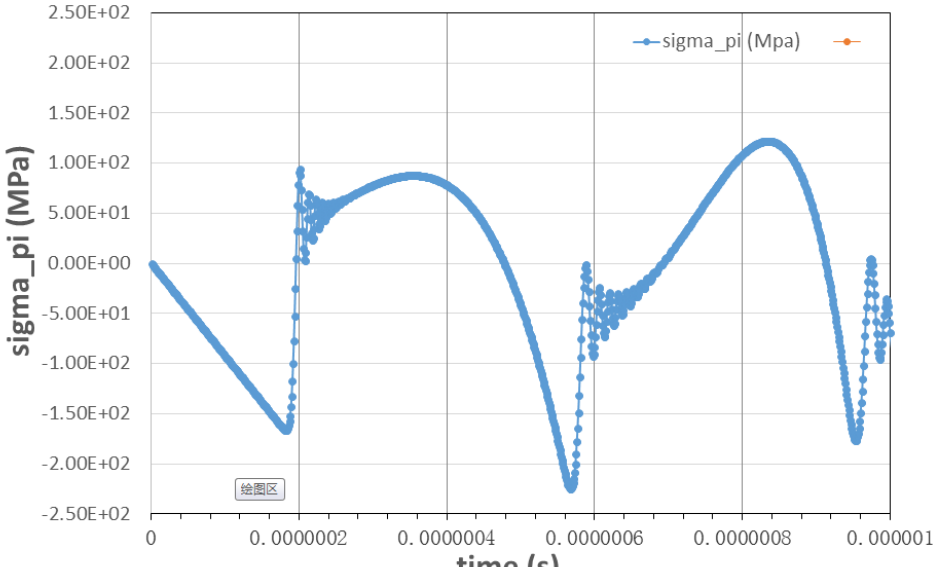


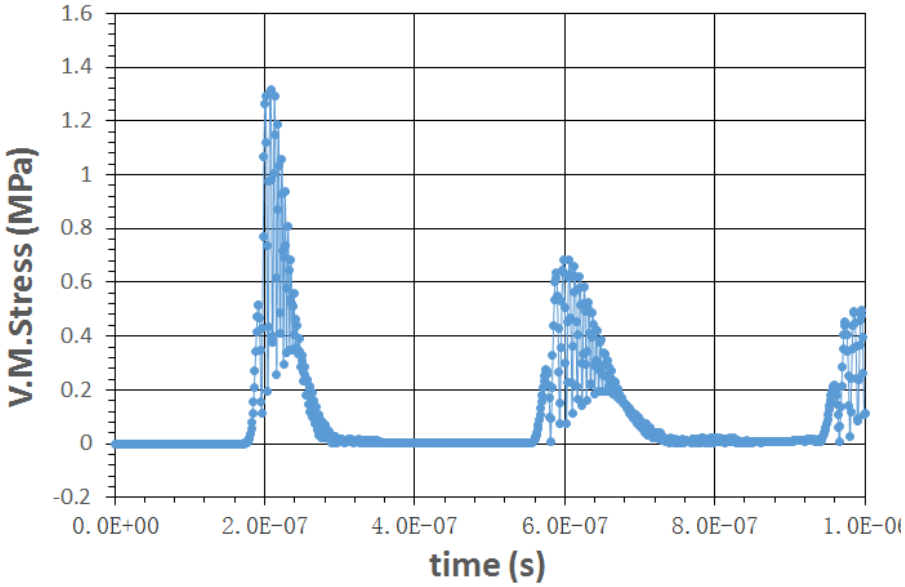


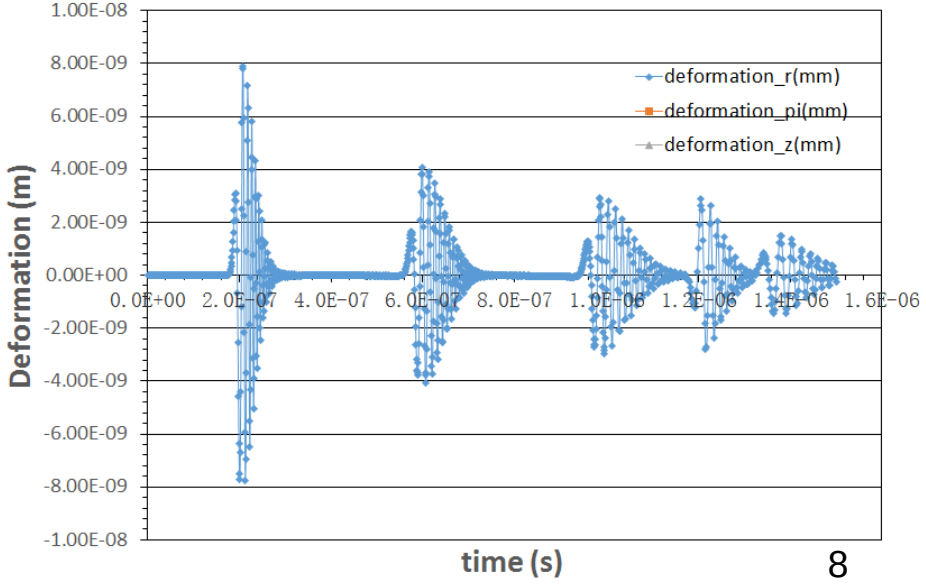


1us heating time, at center

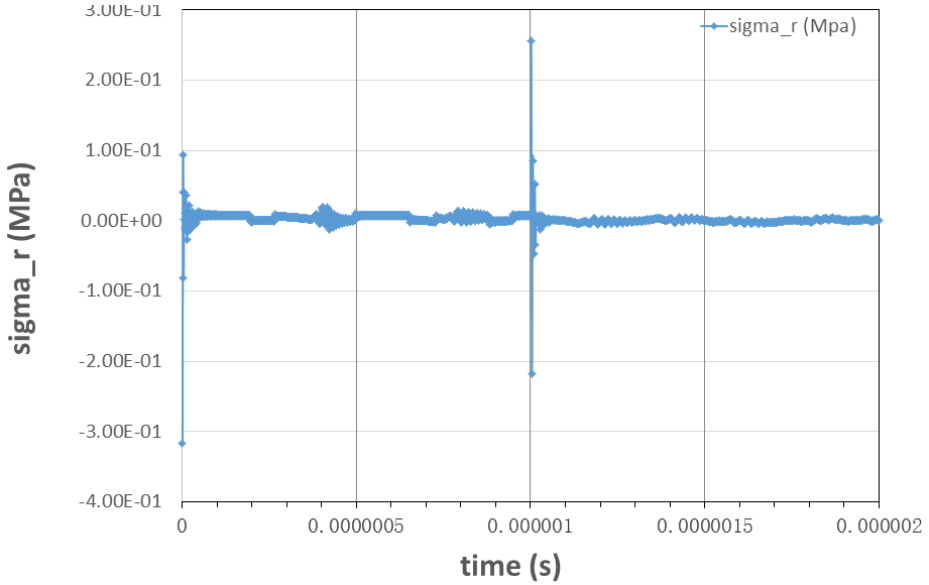


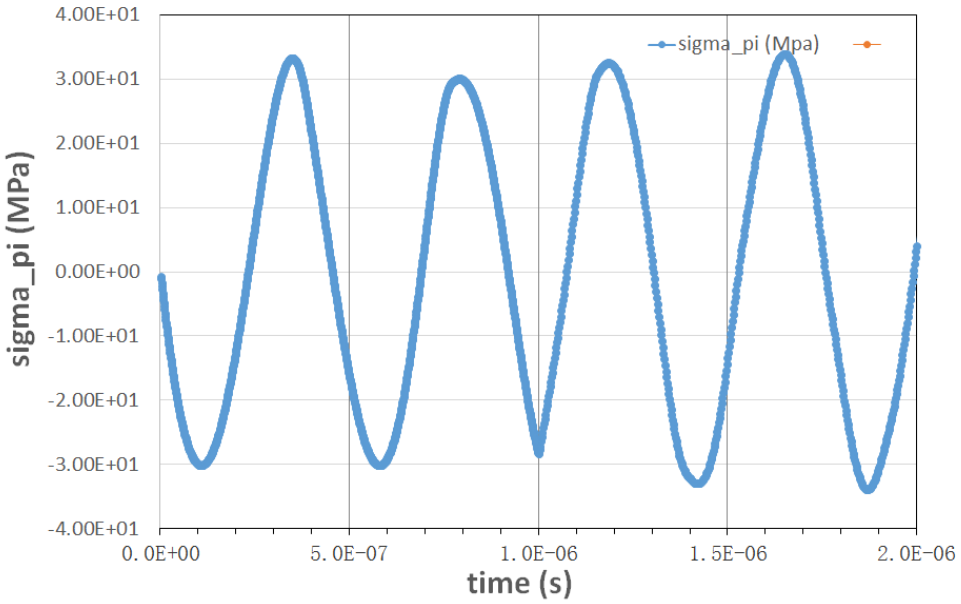


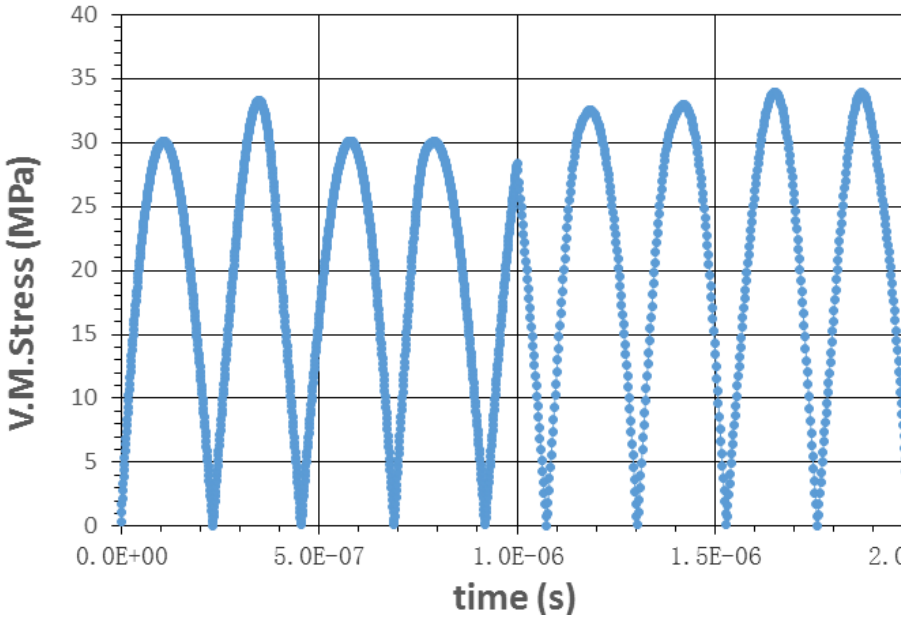


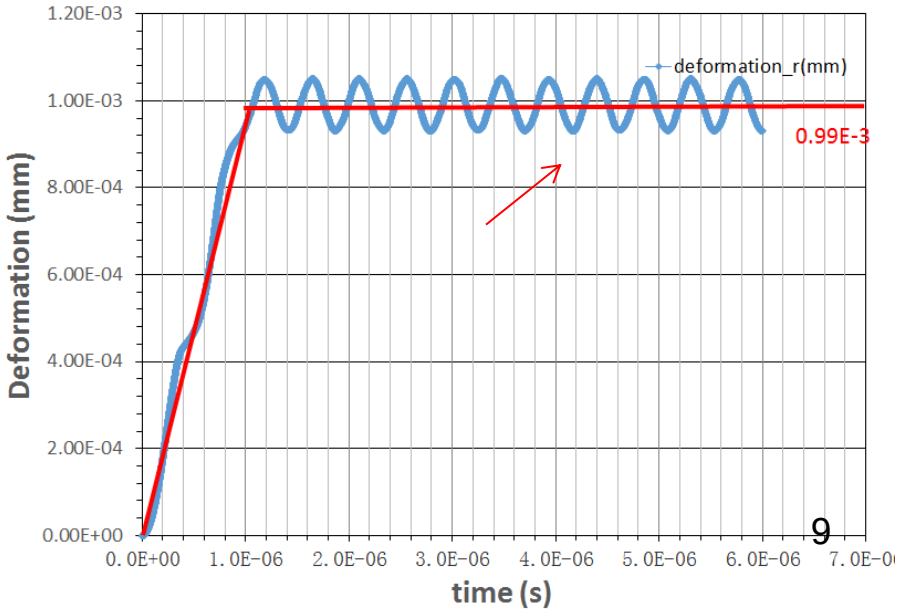


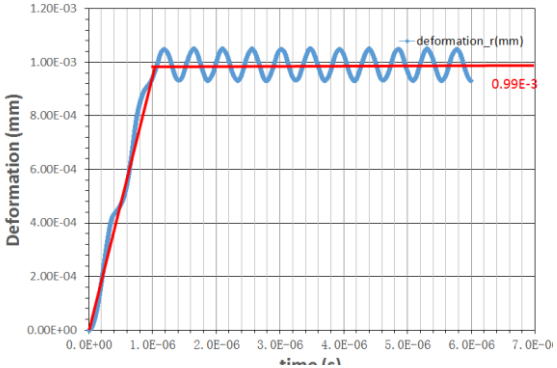
1us heating time, at edge

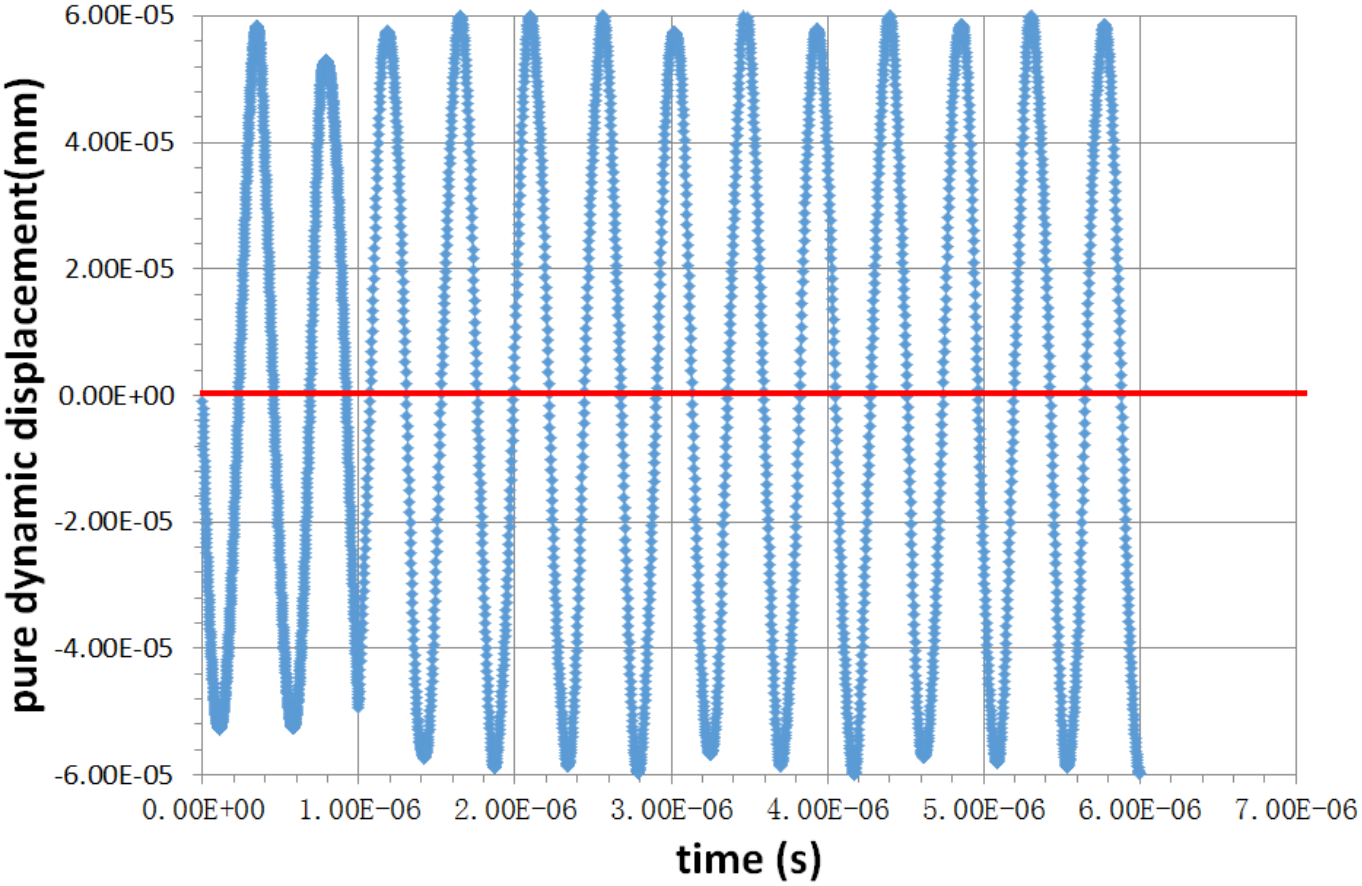









deformation_r(mm)
0.99E-3
Deformation (mm)
1.20E-03
1.00E-03
8.00E-04
6.00E-04
4.00E-04
2.00E-04
0.00E+00
0.0E+00
1.0E-06
2.0E-06
3.0E-06
4.0E-06
5.0E-06
6.0E-06


pure dynamic displacement(mm)
6.00E-05
4.00E-05
2.00E-05
0.00E+00
-2.00E-05
-4.00E-05
-6.00E-05
0.00E+00
1.00E-06
2.00E-06
3.00E-06
4.00E-06
5.00E-06
6.00E-06
7.00E-06
time (s)

Comparison

Heating time	Max. stress at center(MPa)	Max. stress at edge(MPa)
10ns	~20000	~400
100ns	~2000	~400
1us	~100	~30

Summary

- A sphere model was used for the preliminary analyses of granular target with heating time 10ns, 100ns, and 1us.
- The gross structure of stress development with time is consistent with real physical process, but some fast oscillations at some peaks should come from code calculation;
- With longer heating time of 1us, the stress will be much smaller than 10ns and 100ns;
- Next:
  - simulation on the Ti-alloy window will be carried on including buckling and stress analysis;
  - Simulation on the sphere model with non-uniform temperature distribution will be analyzed.

Thank you for your attention!