

Microweekly

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Thermo-compression

Issue

No thermo-compression (4 trials)

Possible causes of the issue

Unwanted material on top of gold even after cleaning



Thermo-compression

EDS analysis

- X-rays from the first 150 nm
- Presence of C, O, Au and Ti on the surface
- Sample was charging, suggesting the presence of a non-conductive layer on top

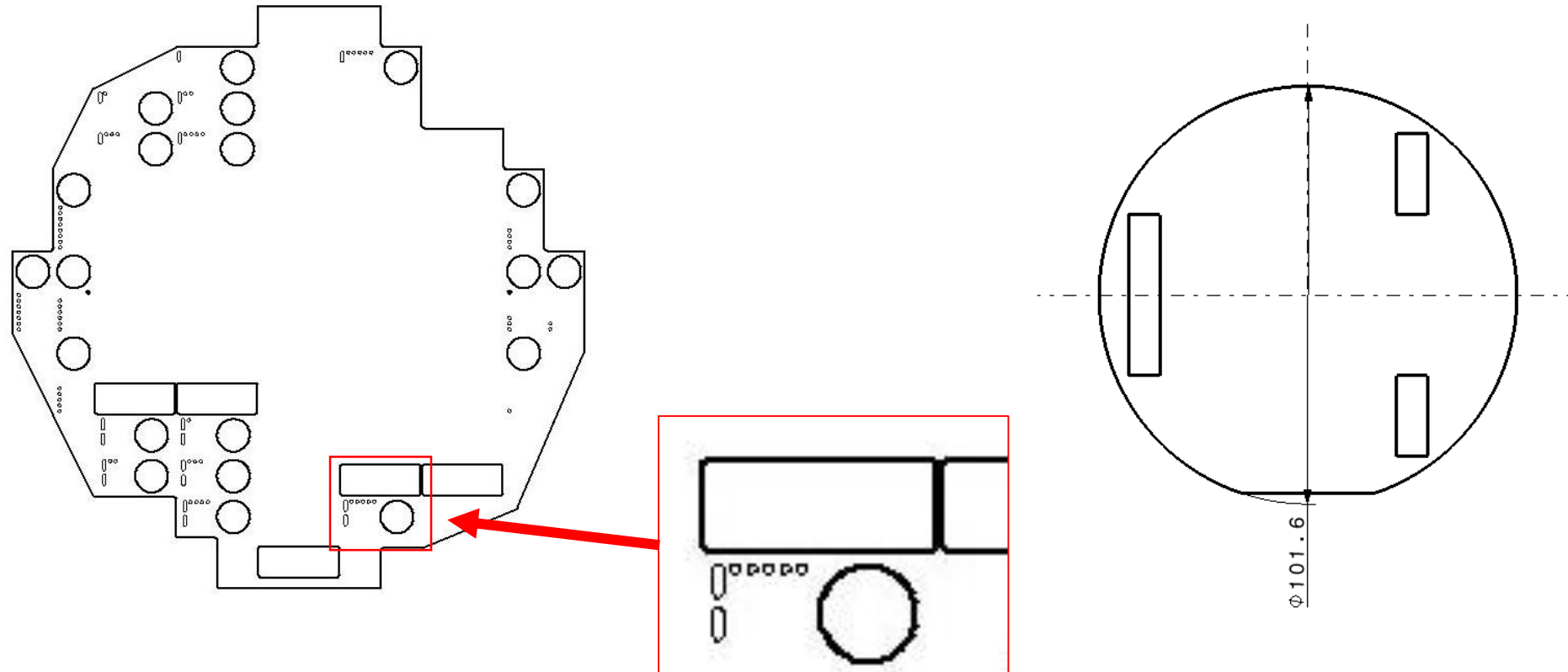
XPS analysis

- As-received surface analysis
 - C, O, Si, Au and Ti.
 - Ti is present in its oxidized state
- After sputtering
 - Si and C disappear
 - Ti is still present
 - Pinholes in the Au layer exposing Ti
 - Ti is mixed in the Gold layer
 - Au layer shows high roughness (Ti in valleys)

Thermo-compression

Shadow masks

- Holes drilling, followed by anodic bonding and then metallic deposition



Adaptation of pressure sample marking for water cutting tool

Bimetallic micro-valve

Model of a membrane with a ring shaped actuator with $\Delta T=40^{\circ}\text{C}$

Normally opened valve

1.



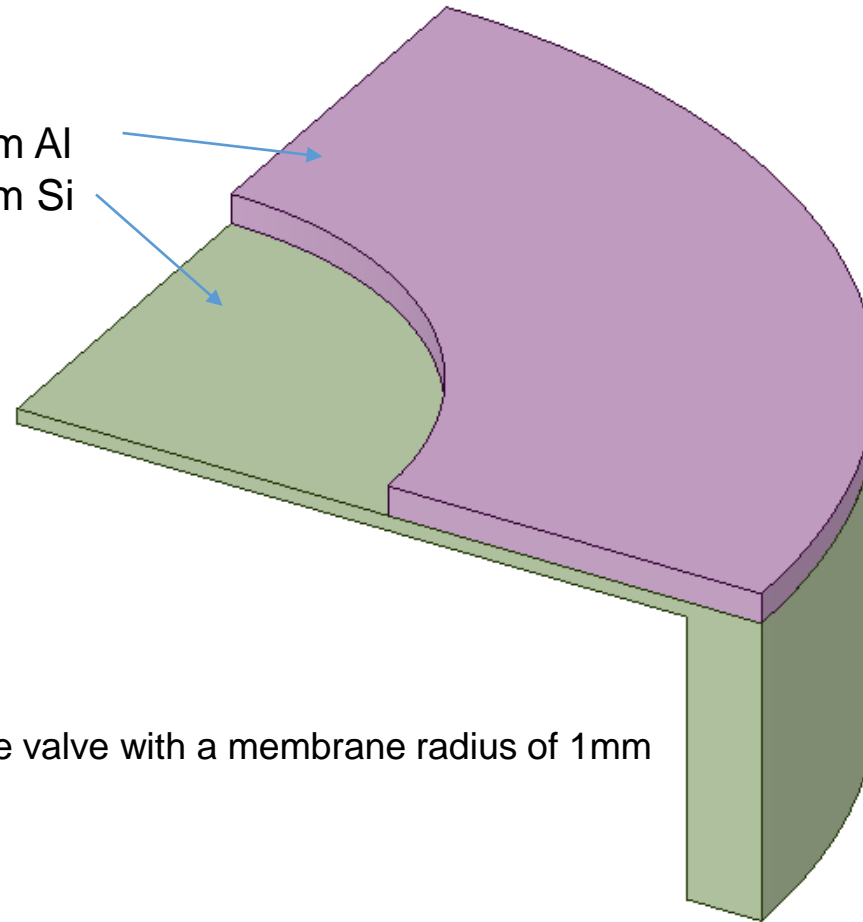
2.



3.



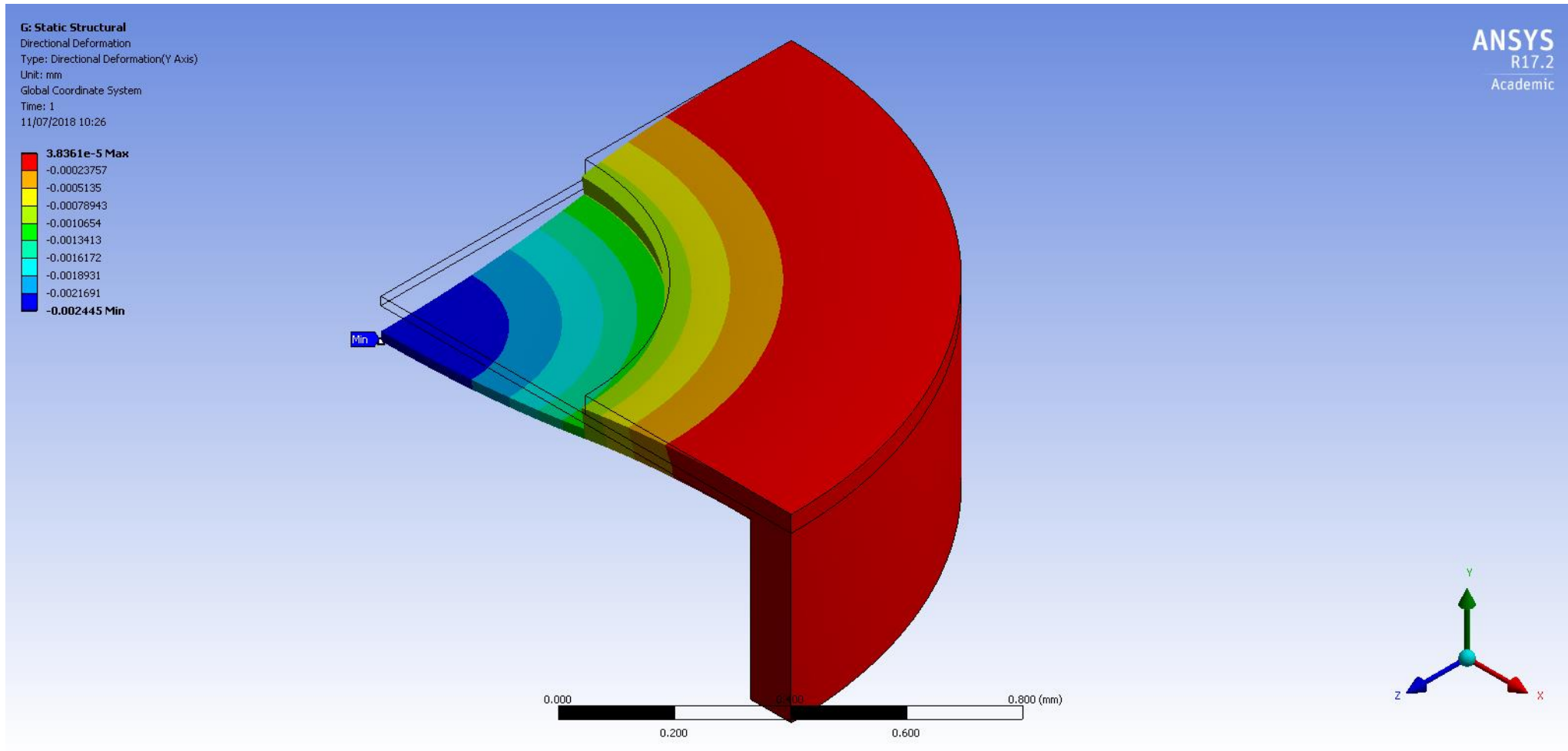
40um Al
20um Si



¼ of of the valve with a membrane radius of 1mm

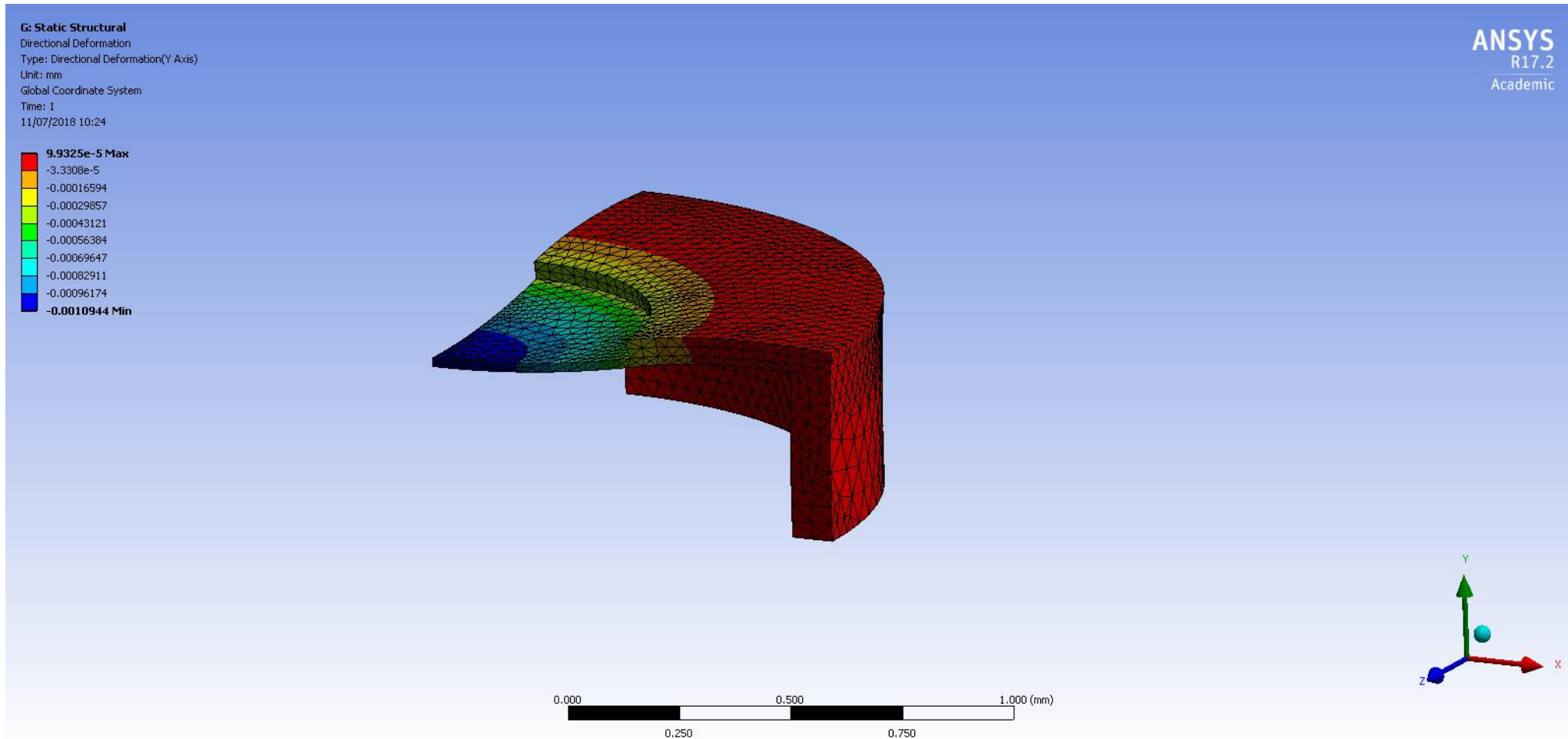
Bimetallic micro-valve

Results Bottom & side fixed



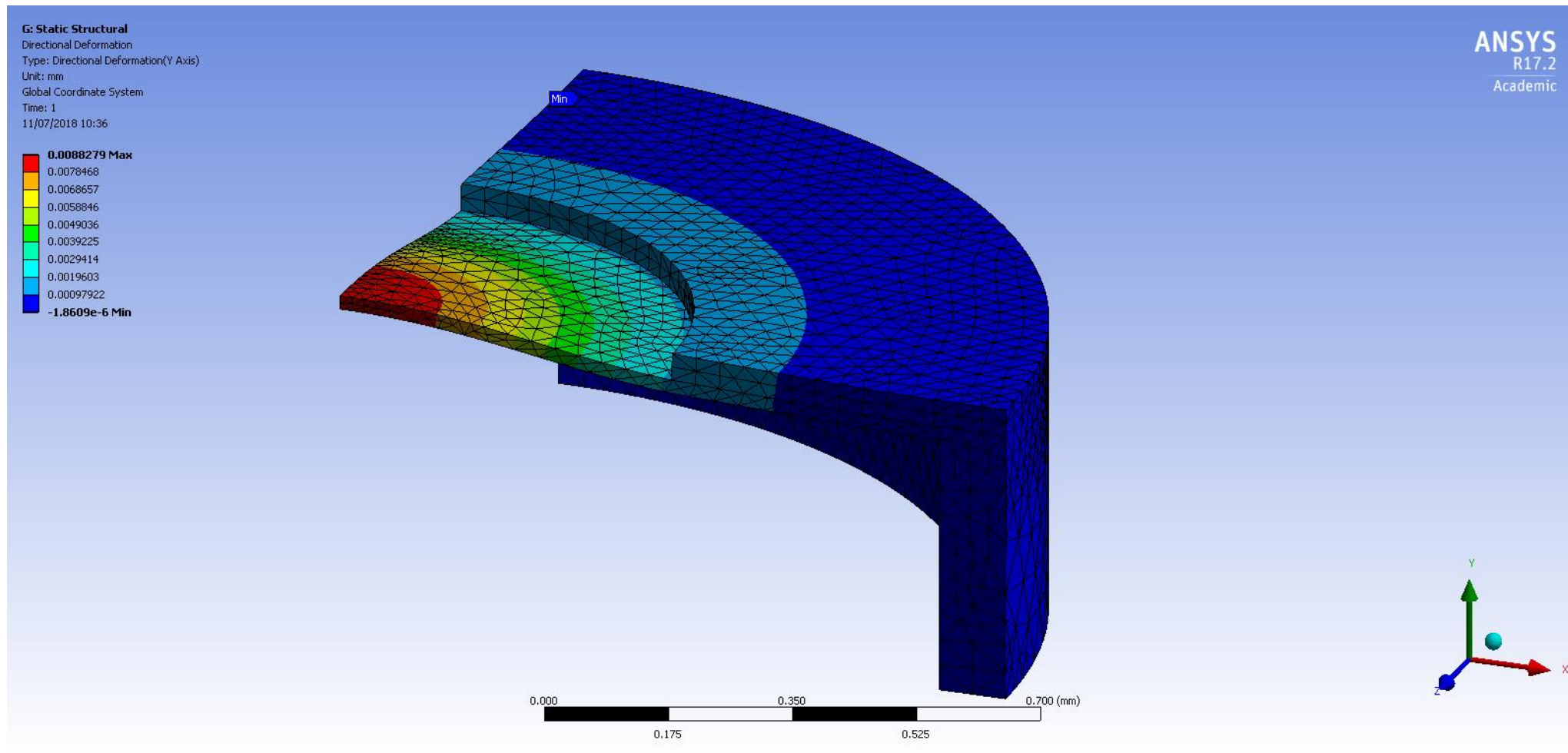
Bimetallic micro-valve

Results Only bottom fixed



Bimetallic micro-valve

Results Bottom & side fixed, pressure difference (inside-outside) of 0.7MPa



Bimetallic micro-valve

Conclusion

- Bimetallic micro-valves are not suited to operate in a normally-opened configuration when there is a pressure difference between the inside and the outside
- Displacement is small with thick membrane
- Membrane with ring shaped actuator is suitable for downward displacement

Outlook

- Performance of piezoelectric micro-valve in similar design (open and ring-shaped actuator)
- Design of a normally-closed bimetallic micro-valve and simulation

Thank you for your attention.

