Experimental study of physical properties of artificial materials for the development of valvular heart apparatus in comparison with biological analogs

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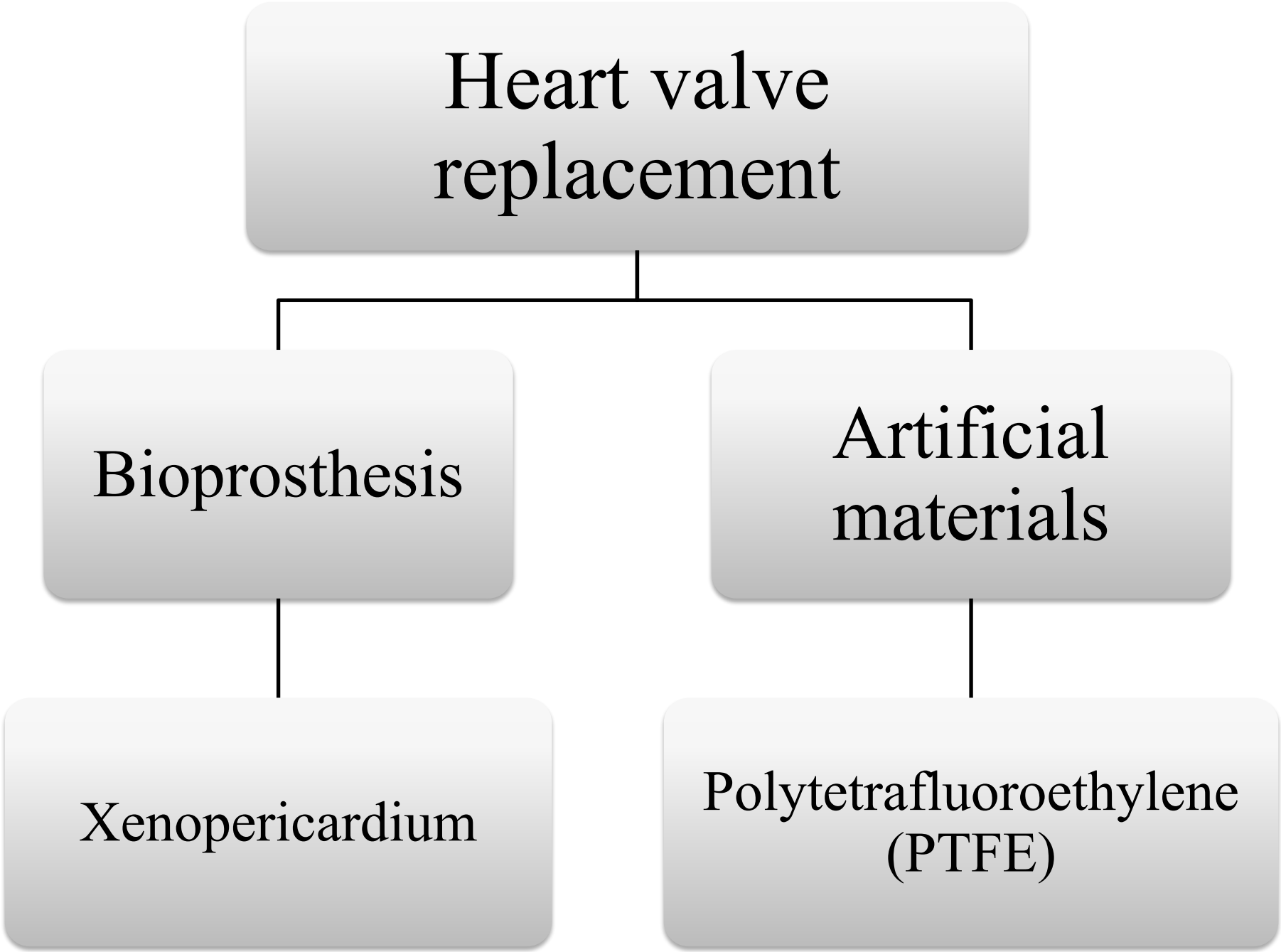
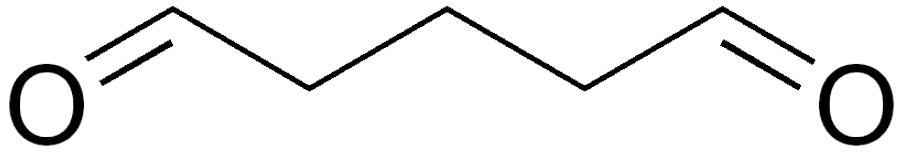
Outline

- Background
- Materials
- Methods
- Results and discussion
- Conclusions


Heart valve replacement
Bioprosthesis
Artificial materials
Xenopericardium
Polytetrafluoroethylene (PTFE)

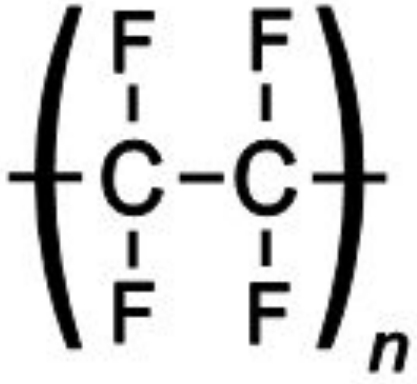
Pericardium

- Natural porcine tissue
- Chemically treated by 0.6% glutaraldehyde



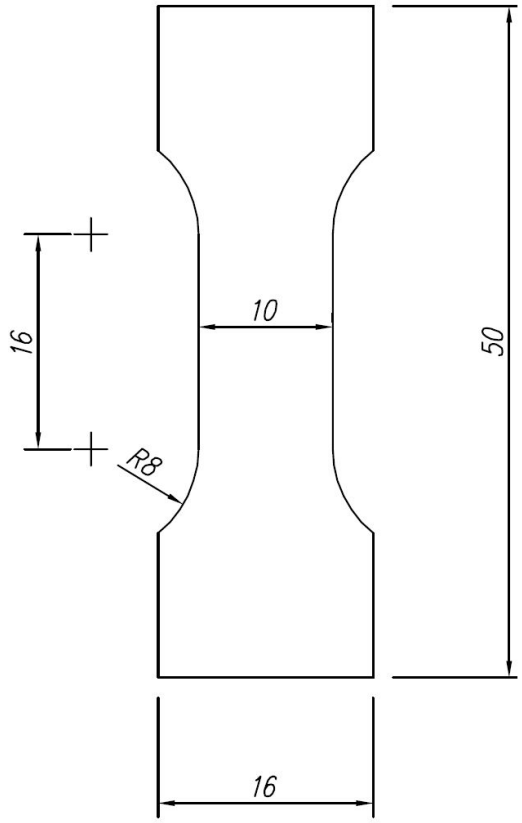
$$-NH_2 + COH- \rightarrow -N=CH-+H_2O$$

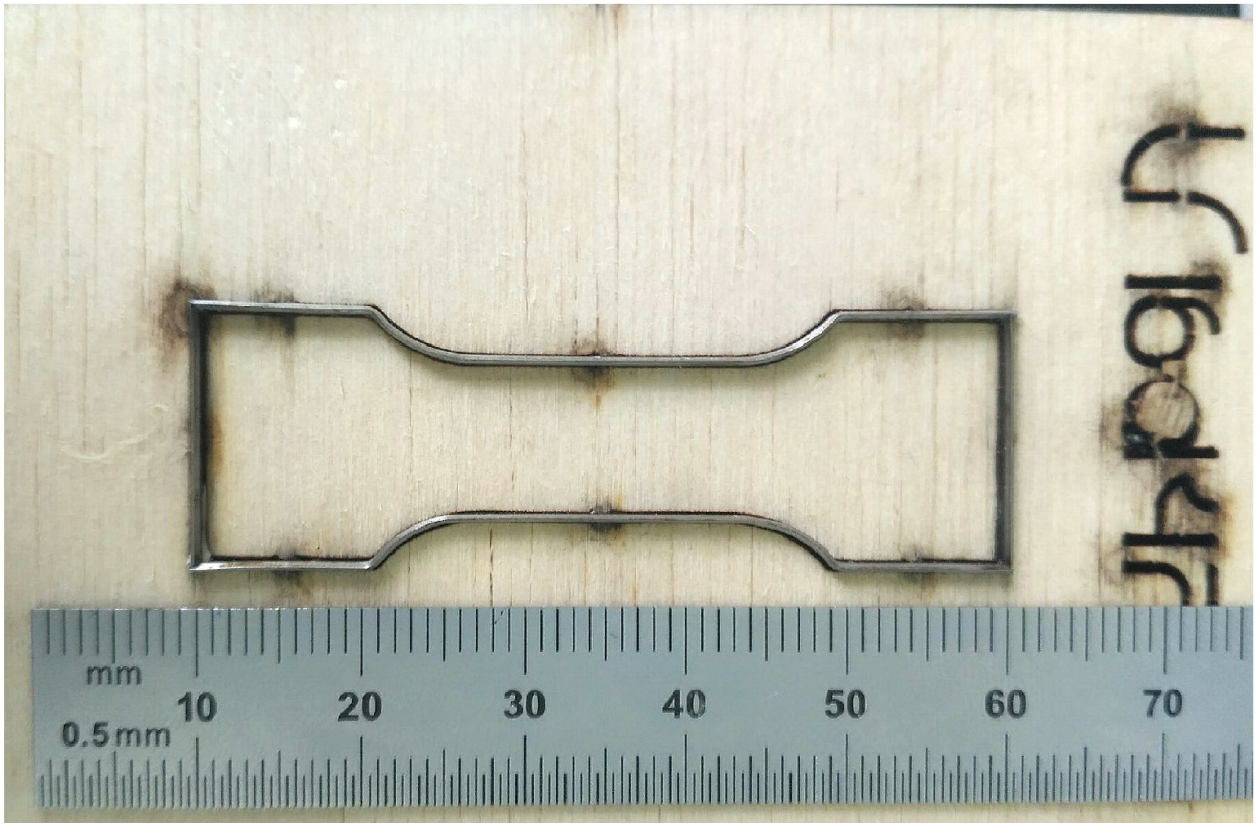
Polytetrafluoroethylene (PTFE)



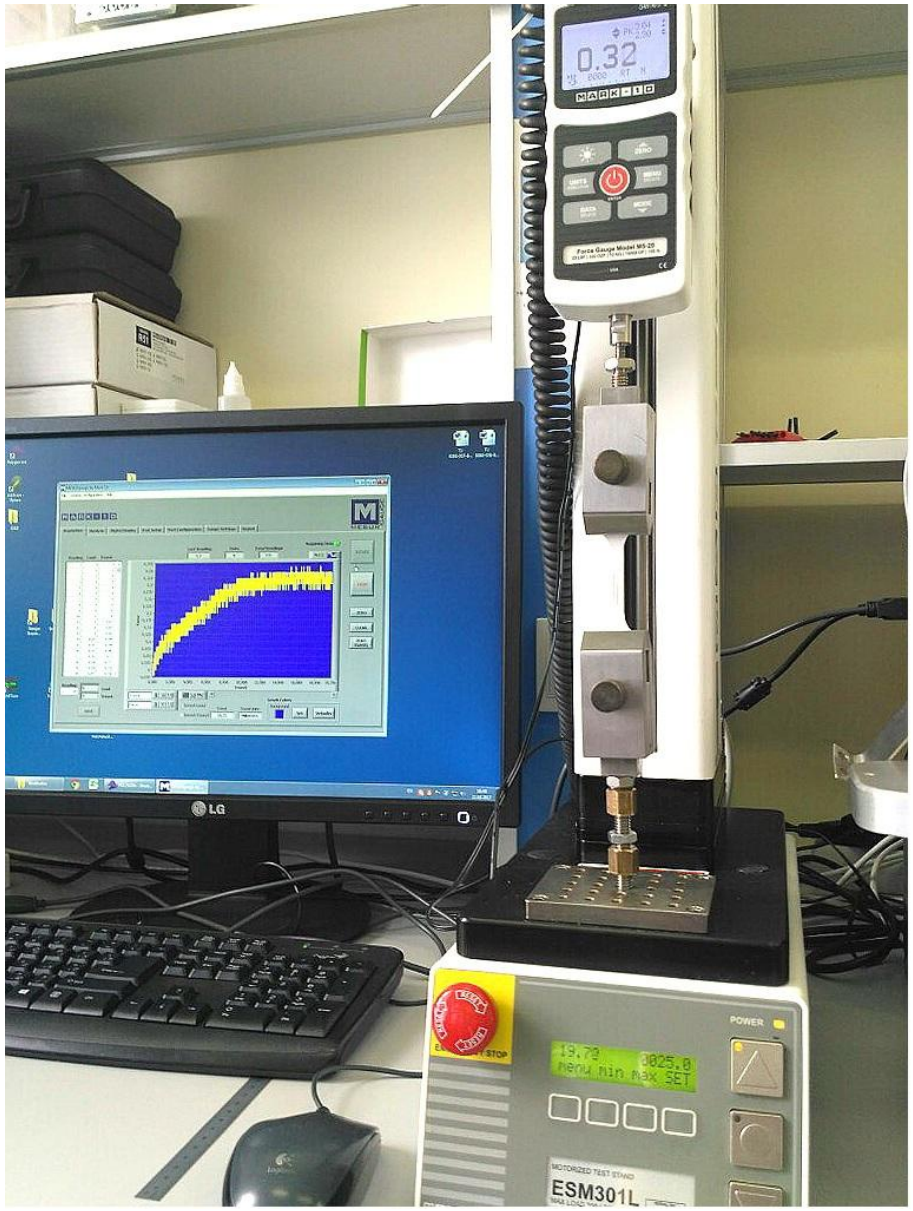
- Expanded – more porous and flexible
- Hydrophobic and chemically inert

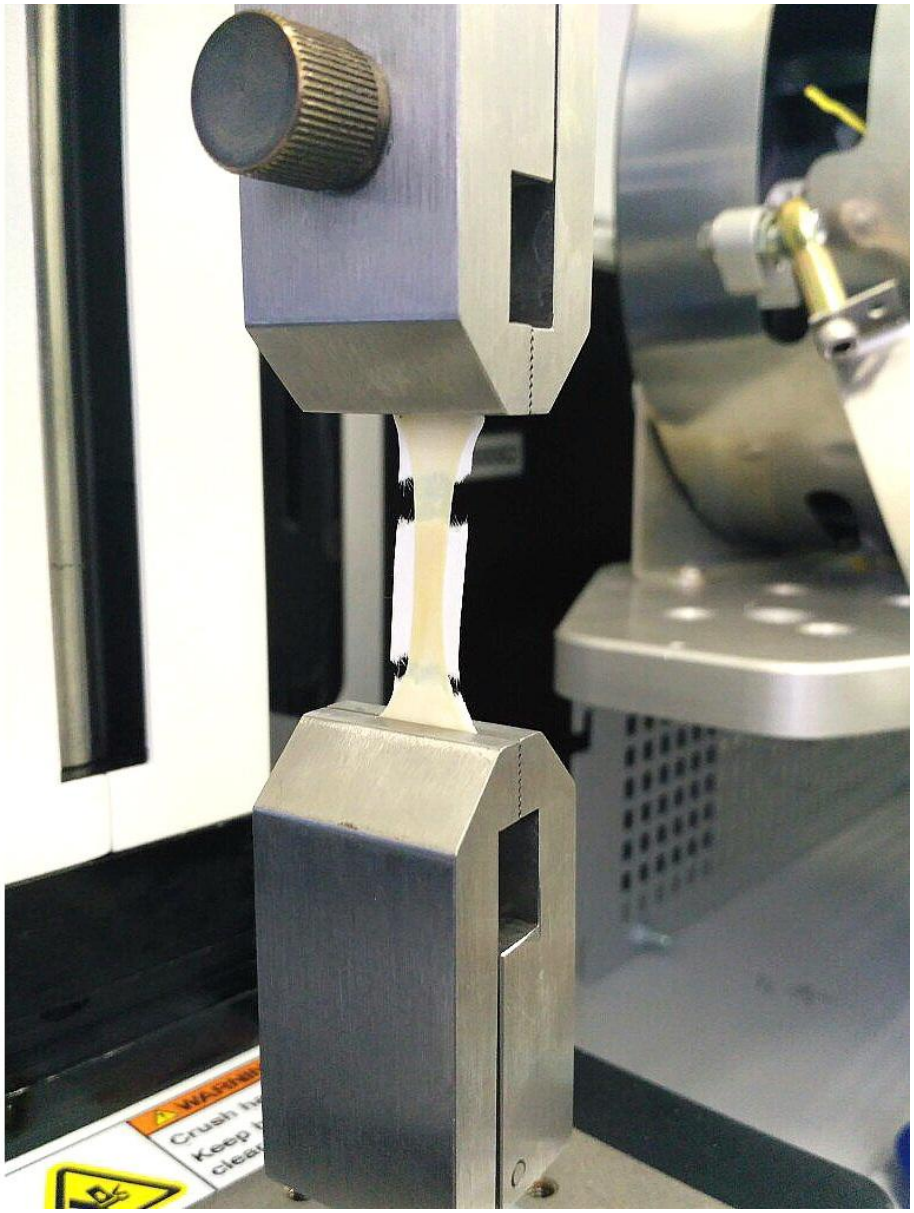
Blanking die



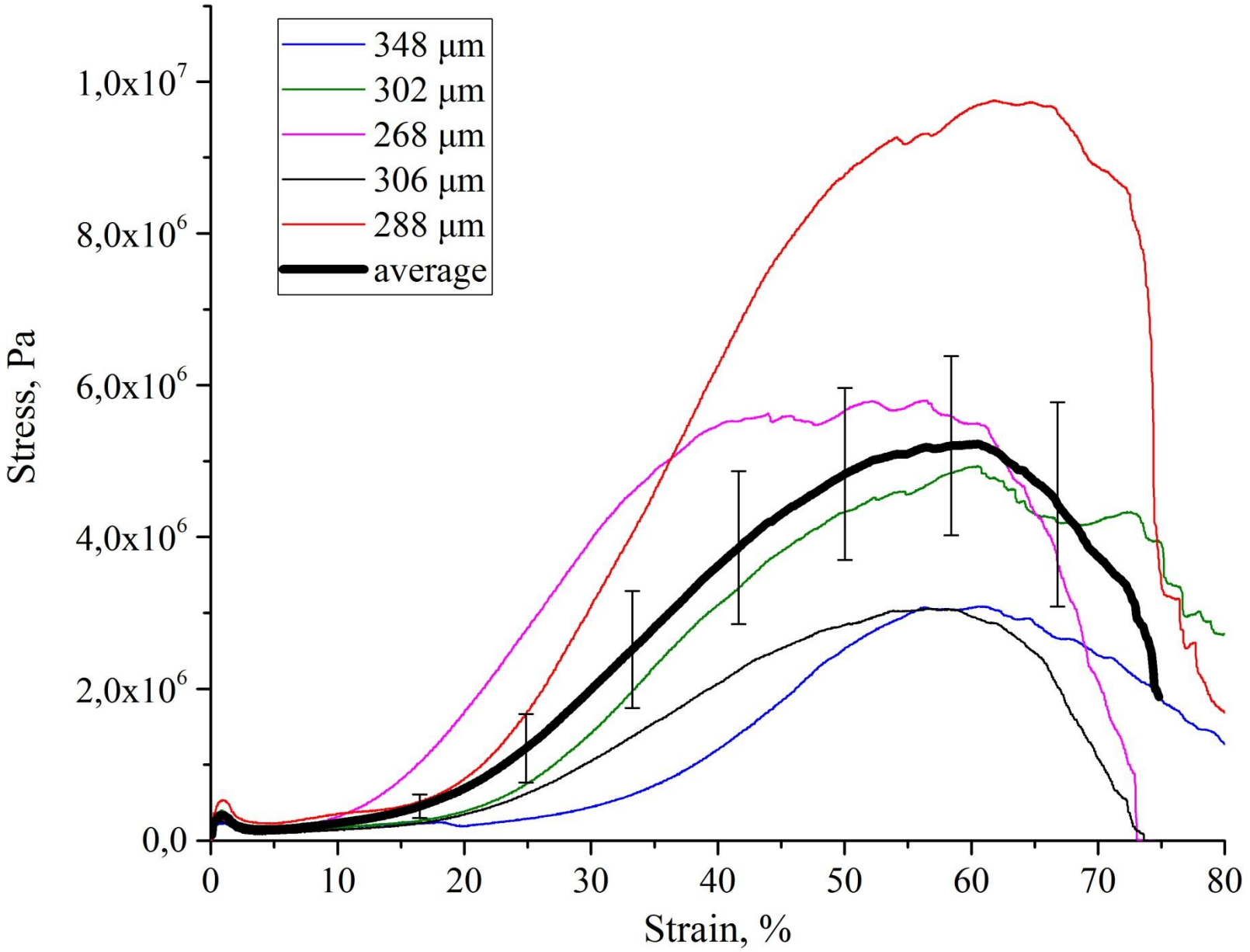


Motorized test stand

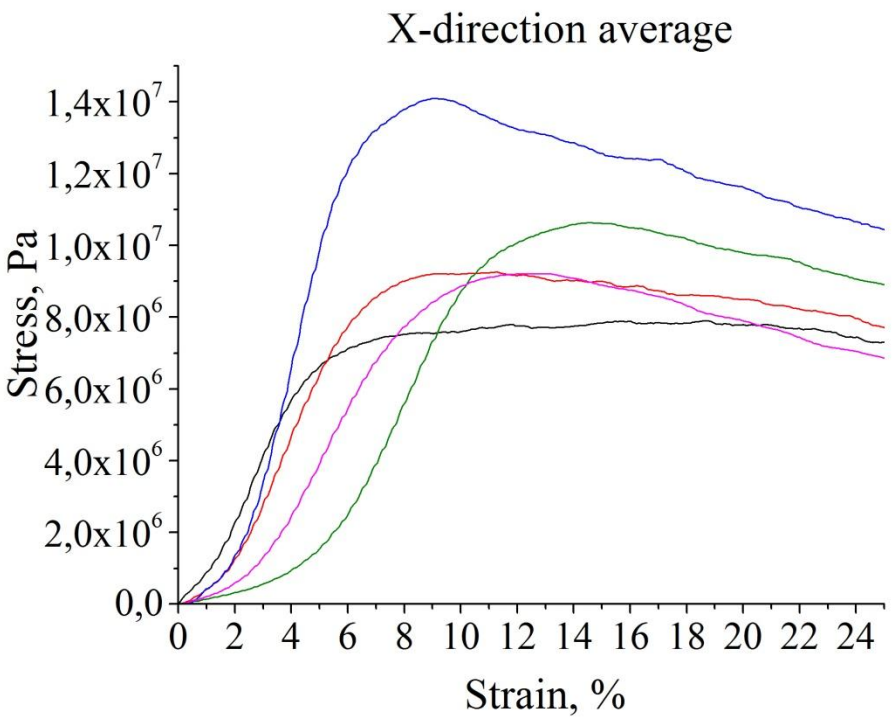


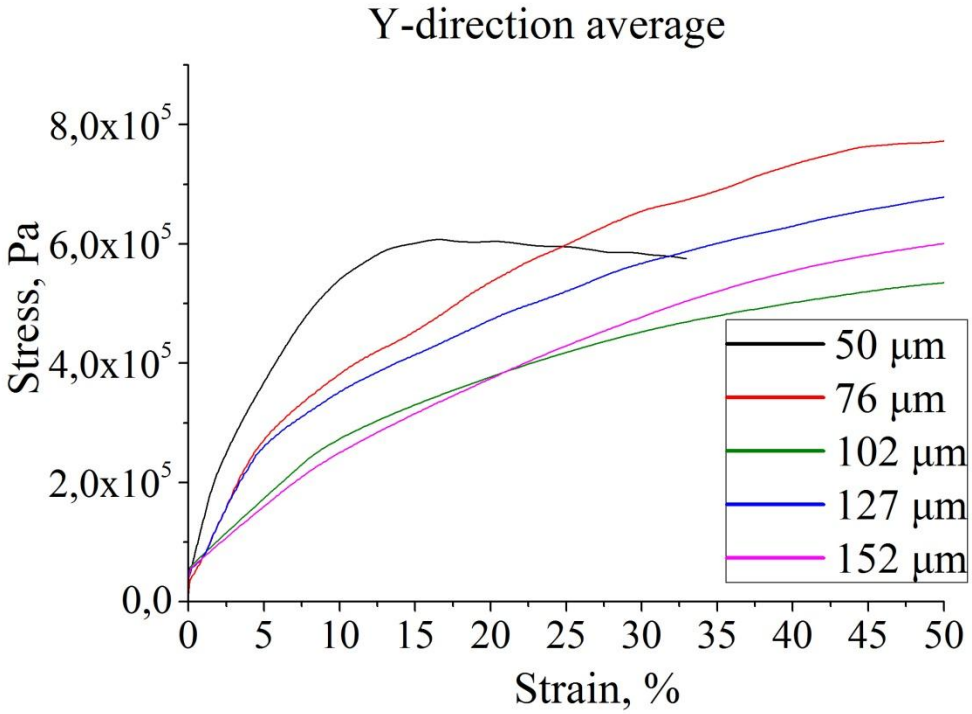


Pericardium tensile test



ePTFE tensile test





Results

Pericardium

- E=1.52 MPa
- UTS=5.22 MPa
- Elongation at breakpoint is 60.4%

ePTFE

- E>15 MPa
- UTS=9.2÷11.3 MPa
- Elongation at breakpoint is 8-14%

Conclusions

- The elastic modulus of ePTFE samples is significantly higher than that in pericardial samples
- The form of stress-strain curves of ePTFE depends on the stretching direction
- The next step: enhancement of quality of ePTFE sheet
- Test other polymeric materials

References

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