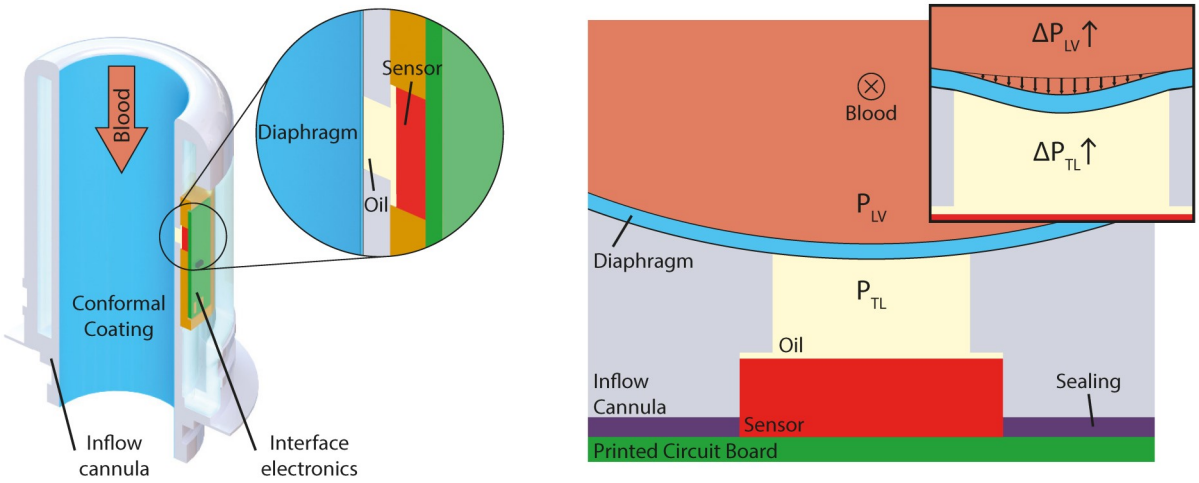
ETH zürich

Licensing Opportunity

Smooth interface diaphragms for non-disruptive monitoring of blood flow



Integration concept of the pressure sensor in the inflow cannula of a blood pump. (left) concept design for integration into a the inflow cannula of an artificial heart pump, (right) illustration of the functional principle of the integration

Application

A suspended diaphragm serves as the interface between blood stream and blood pressure sensor. The diaphragm maintains the quality of pressure measurements of the sensor unit in linearity and long-term stability. A fabrication method for the seamless integration of the diaphragm and sensor into the inflow cannula of a commercial blood pump is presented.

Features & Benefits

- Excellent biocompatibility by seamless sensor integration
- Long-term stable measurement results, no sensor drift in-vitro observed
- Minimizing the intrusiveness of the sensor

Publications

- "Novel Sensor Integration Approach for Blood Pressure Sensing in Ventricular Assist Devices", Procedia Engineering 168 (2016) 71-75 https://doi.org/10.1016/j.proeng.2016.11.150
- Patent granted

ETH transfer
transfer@sl.ethz.ch
www.transfer.ethz.ch
+41 44 632 23 82

Reference 2016-011

Invented by:
Bio Engineering Laboratory
Silvan Staufert, Christofer Hierold, Christian Peters

Technology Readiness Level

1 2 3 4 **5** 6 7 8 9

Background

Current blood pumps lack implanted hemodynamic monitors, which could provide essential feedback for the adjustment of the pump speed. Monitoring devices must be highly reliable and robust. Also, a smooth sensing interface is required to eliminate the risk for increased thrombogenity and hemolysis.

Invention

A thin, suspended diaphragm provides a sensing interface for a pressure sensor that is integrated into the wall of an inflow cannula of a heart pump. The fabrication steps for the diaphragm are as follows: First, the recess is formed in the inflow cannula (e.g. drilling). A core is inserted into the cannula, which serves as a mould surface. It is important that the core is tightly interlocked with the cannula. The recess is filled with sacrificial material, then the core is removed. A 10 µm thin film of Parlene-C is deposited on the inside of the cannula. Finally, the suspended diaphragm is obtained by dissolving the sacrificial material from the outside of the cannula. The recess is then sealed enclosing a silicone oil as pressure transmission liquid and a pressure sensor. First characterization measurements show that the resulting sensor assembly behaves linearly and has an absolute measurement error below 104.2 Pa at a measurement range of 80 kPa-130 kPa.