07.06.2022

Acoustically mediated drug delivery device with frequency selectivity

Master/Semester project

(Section: Microengineering – Mechanical Engineering)

Actively controlled release function is important for implantable drug delivery device. Because we can achieve sophisticated and personalized treatment according to the patient's feedback after the implantation. Acoustic field is suitable for external stimulus for active controlled release due to its body penetration ability, biocompatibility, and low manipulation power. When acoustic field exposed to the drug solution encapsulated device, acoustic pressure cause by standing waves give stress to the sealing layer. Acoustic harmonic frequency of the device which gives maximum vibration can be tuned by changing the design of the capsule. By using this phenomenon, we can selectively open the sealing layer of the device with different shape. (Figure 1) This project will mainly compose of the two-part simulation and design part and test part. For the simulation and design part, you will design and optimize the device structure according to the simulation results of its vibration force distribution to device in a fluid environment under acoustic wave exposure. For the test part, you will set up the platform for acoustically mediated drug release experiment. The simulation will be 6-7 weeks and fabrication of the prototype and acoustic release test will take 7 weeks.

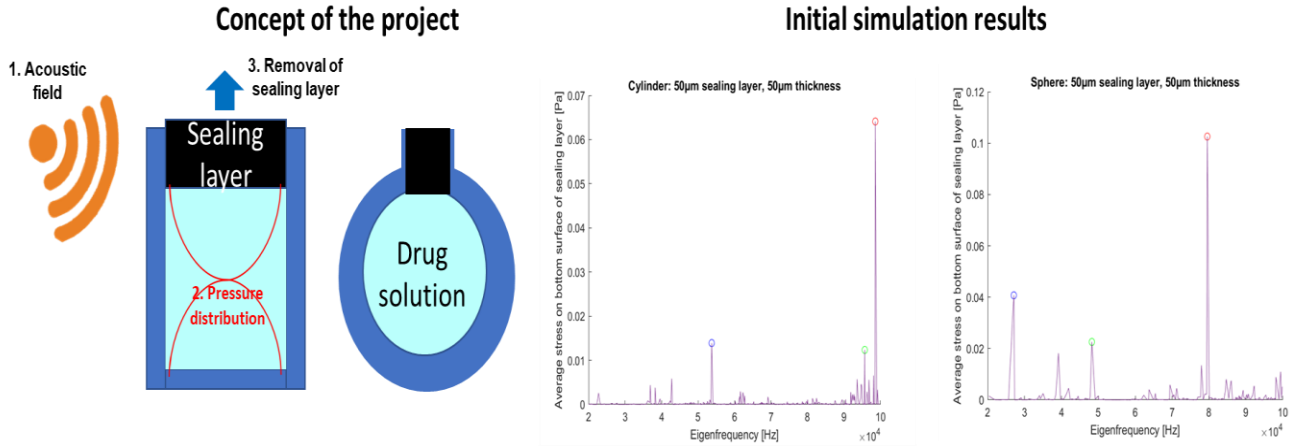

Figure 1. Right to left: Concept of the project, Initial simulation results: Stress applied on sealing layer according to the frequency.

Work description:

• COMSOL simulation to figure out each design's harmonic frequency which give maximum stress to the sealing layer

• Setting up the platform for acoustically mediated drug release experiment.

• Acoustically mediated drug release experiment

Contact : Jongeon Park (jongeon.park@epfl.ch)

École polytechnique fédérale de Lausanne

Microsystems Laboratory 1
(Prof. J. Brugger)

EPFL STI IMT LMIS1
(Batiment BM)
Station 17
CH - 1015 Lausanne

Phone : +41 21 693 53 37
E-mail : jongeon.park@epfl.ch
Office : BM 3.109