Healthy Aims project

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The Healthy Aims project is developing key microsystem technologies and communication methods that bring intelligence directly to the human, in the form of medical implants and ambulatory measurement systems. Data from these devices is transmitted out into a wider environment for remote monitoring and control.

The role of QMUL in the project is to develop biomaterials which could be used as coatings for the medical devices developed by partners.

New complementary biocompatible coatings for microelectronic implantable devices are being developed and optimised within the Programme. These coatings have proved to be flexible, able to conform to the surface of irregularly shaped devices, have an improved impermeability to avoid ingress of biological fluids to the device, and are also biocompatible, to avoid unfavourable reactions within the body. They are also designed to have strong adhesion to the underlying substrate.

Modified materials include silicone rubbers, polyurethane (PU) and diamond like carbon (DLC).

Silicone rubber has been frequently investigated as a medically approved sealing material however, its effectiveness is far from perfect especially in regard to water impermeability. Modification of bulk silicone properties was achieved through physical entrapment of lipids resulting in some lowering of water transmission rate and more elastic mechanical properties.

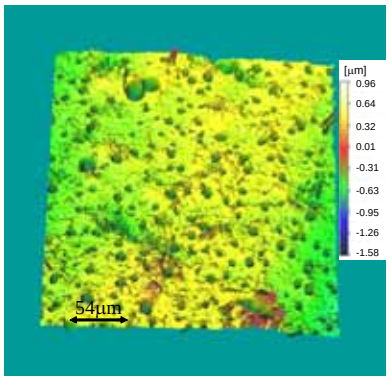
Before coating

Before coating

Coated with silicone modified with 1% w/v IPM

Coated with silicone modified with 1% w/v IPM

HA devices coated with lipid modified silicone

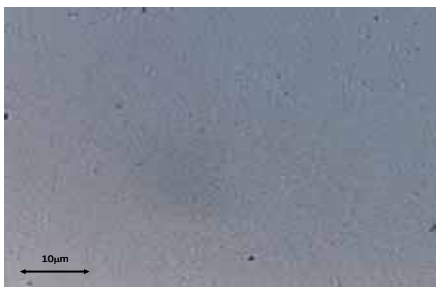


Confocal light microscope image of modified polyurethane

A low surface energy agent was used to modify polyurethane with improved water resistance and improved mechanical properties. Moreover, it was found that when incorporated into PU, the low surface energy component was able to migrate to the PU surface creating an outer hydrophobic (better for body liquid resistance) and an inner hydrophilic interface (better adherence to substrate).

Diamond like carbon is an amorphous carbon containing coating material as it is biocompatible, hard but flexible, chemically inert and diffusion resistant.

DLC coatings led to ultrathin (<1um), coherent, adherent films on both flexible and inflexible substrates. By applying various parameters for DLC deposition it was possible to select the most suitable ones as packaging for the implantable electronic devices.



Light microscope image of DLC deposited on silicone

http://www.healthyaims.org