The Joint Characterisation Study of New Surface Modified Biomaterials

Between December 2020 and March 2021, the Biomaterials group led by Professor Ying Yang in Keele University has undertaken series of collaborative characterisation work on the surface modified fabric materials produced by Shimyatech Ltd. These fabric samples have been subjected to various surface treatments aiming to equip them with strong anti-bacteria and anti-virus capacity.

In total, 18 fabric materials have been received (first batch 12 and 6 in the second batch plus their blank counterpart). Majority of the samples have been analysed with some repeating analysis for a few more interested samples for example number 1 series, number 8 and number 12.

The characterisation of these samples are centred on the physical and chemical properties. There is no biological assessments were undertaken.

Four main techniques have been used to reveal the effect of surface modification impact on the change of physical properties and addition of new chemical elements which play the anti-bacteria and anti-virus role on the surface after the surface treatments. There techniques are contact angle measurement; Fourier transform infrared spectroscopy; inductively coupled plasma optical emission spectrometry (ICP-OES) and scanning electron microscopy (SEM) plus EDS analysis.

In general, the four techniques have comprehensively and complementarily revealed rich information on the treated materials and enabled to address whether the surface treatments are successful in comparison to the blank sample; whether specific metallic elements which play the key anti-bacteria and anti-virus properties have been introduced on the surface by complementary techniques examination: ICP-OES for the element in liquid after the oxidation of the samples; SEM/EDS for the element in solid phase when the samples are in intact form. The two mini-data documents attached are the summary of ICP-OES data, FTIR and contact angle data. SEM data are too big to include, but all raw data have been sent to ShiymaTech Ltd.

In conclusion, the surface modification of the fabric is effective. The physical and chemical property changes provide evidence that the modified surface shall have anti-virus and anti-bacteria properties.

Statement of the Research Collaboration with ShimyaTech

Keele University is renowned for its exciting approach to higher education and excellent research in healthcare field. The Faculty of medicine and health science has one leading research centres in primary care and musculoskeletal disorders among UK. Three affiliated NHS hospitals, University Hospitals of North Midlands, Robert Jones and Agnes Hunt Orthopaedic Hospital (Oswestry) and the Haywood Hospital, Stoke on Trent offer strong clinical research input. In addition to routine research facilities for tissue, cellular, protein and genetic analysis facility, the Faculty and Natural science faculty have multiple chemical, physical and surface characterization facilities to undertake biomaterials (implants) development and characterisation research including biomaterials fabrication facilities (electrospinning, 3D printing, nanoparticle generator etc.); mechanical testers (peer testing); zetasizer; ICP-OES; rheometer; microCT; SEM/EDX; TEM; confocal microscopy; OCT; histochemistry lab.; GC-MS, HPLC, MALDI 4800 ToF.

In the past years, the biomaterials research group in Keele university, led by Professor Ying Yang has built strong collaborative research relation with ShimyaTech aiming to explore novel biomolecules, new coupling agent and new processing technology for anti-biofilm, anti-fouling surface. The diverse characterisation and analysis expertise and technology in Keele University will support new product development in ShimyaTech.