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바이오공학부문

2022년 춘계학술대회 초록집

일 시 : 2022년 4월 20일(수)～ 22일(금)
장 소 : 아일랜드 리솜
주 관 : 대한기계학회 바이오공학부문

후 원 : ㈜티앤알바이오팹, ㈜코렌텍, 유엔아이㈜, ㈜호모미미쿠스, ㈜티디엠,
㈜퓨전테크놀로지, ㈜메타바이오메드, ㈜엘쏠텍, ㈜자이브솔류션즈

KSME 사단법인 대한기계학회

[2022년 4월 22일(금요일)]

[09:00 ~ 10:40]	**여성과학자 초청 세션**	**좌 장: 여선주(KIMM), 임현의(KIMM)**

KSME 22BE-Fr02A01 Inorganic-Nanoparticle-based Superhydrophobic Colored Coatings for Sustainable Building-Integrated Photovoltaics/ 여선주, Sandipan Bera, 김부성, 이보연, 박승철, 임현의(KIMM)

KSME 22BE-Fr02A02 Microgel coated surfaces for temperature-controlled cell sheet harvesting./ 김혜정(고려대)

KSME 22BE-Fr02A03 Artificial intelligence-assisted image analysis in a biomimetic bone-on-a-chip platform for osteoporosis drug testing/ 김정아(KBSI)

KSME 22BE-Fr02A04 The formation of rippled edges in leaves/ 이안나, 곽현수, 기강현, 김준식(포항공대)

KSME 22BE-Fr02A05 뇌-혈관 장벽 모사 칩 개발 및 뇌약물분포 연구로의 응용/ 안송이(부산대), Yoshitaka J. Sei(Georgia Tech.), 박현지, 김진환, Allan I. Levey, 김용태(부산대)

KSME 22BE-Fr02A06 Soft, Skin-Interfaced Microfluidic Systems for Dynamic Range Sweat Sensing/ 양다솜(Northwestern Univ.) Donghwan Kim(성균관대), John A. Rogers(Northwestern Univ.)

[13:00 ~ 14:00]	**구연: Biofabrication**	**좌 장: 서경덕(원광대)**

KSME 22BE-Fr02C01 Fabrication of nanofibrous microwell array with controllable size, aspect ratio, and density through thermoforming process/ 김도희, 이성진, 윤재승, 홍현준, 엄성수, 김동성(포항공대)

KSME 22BE-Fr02C02 Bioprinting of Physiomimetic Human Islet-like Cellular Aggregates-Vascular Platform for Functional Maturation of Beta Cells/ 김명지, 조승연, 장진아(포항공대)

KSME 22BE-Fr02C03 3D Bioprinting-based Tissue Assembly to Modulate Contraction Direction of Engineered Heart Tissues/ 황동규, 용의중, 최환용, 장진아(포항공대)

KSME 22BE-Fr02C04 분기점에서의 누수 방지와 세포배양이 가능한 전기방사 공정 기반의 Y자 인공혈관 공정 조건 탐색 및 제작 / 조준희(포항공대), 엄성수, 김동성

KSME 22BE-Fr02C05 The fabrication method of electrospun nanofiber mebrane integrated PDMS microfluidic chip with an assist of the functinal layer/ 류준열(포항공대), 윤재승, 엄성수, 김동성

[14:20 ~ 15:00]	**구연: 3D Printing & Tissue Engineering**	**좌 장: 이준희(KIMM)**

KSME 22BE-Fr02D01 3차원 세포 프린팅 기술을 이용한 혈관-림프관이 포함된 전이성 흑색종 모델 개발/ 조원우(포항공대), 안민준, 김병수(부산대), 조동우(포항공대)

KSME 22BE-Fr02D02 3D Cell Printing of Vascularized Patient-Derived Gastric Cancer Organoid model for Preclinical Assays by Providing a Tissue-Specific Microenvironment/ 김지수(포항공대), 정재호(연세대), 장진아(포항공대), 조동우

KSME 22BE-Fr02D03 3D Printing of Tissue-Sensor Biohybrid Platform for Continuous Monitoring of Contraction Changes Induced by Drug Cardiotoxicity/ 용의중(포항공대), 김동환(Georgia Tech.), 김호중(포항공대), 황동규, 조성건, 남효영, 김세진, 김태영, 정운룡, 김기훈, 정완균, 여운홍(Georgia Tech.), 장진아(포항공대)

KSME 22BE-Fr02D04 Engineering Densely Packed Adipose Tissue via Environmentally Controlled In-Bath 3D Bioprinting/ 안민준(포항공대), 조원우, 김병수(부산대), 조동우(포항공대)

3D 바이오프린팅 기반 조직 어셈블리를 통한 심근 조직 수축 방향 조절

황동규*· 용의중**· 최환용**· 장진아*, **, ***†
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**IT 융합공학과, 포항공과대학교
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3D Bioprinting-based Tissue Assembly to Modulate Contraction Direction of Engineered Heart Tissue

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Key Words: Tissue assembly(조직 어셈블리), 3D bioprinting (3D 바이오프린팅), Engineered heart tissue (인공 심근 조직)

The advent of engineered heart tissue (EHT) allows researchers to investigate human pathophysiology with human induced pluripotent stem cells. Strip-and ring-type EHTs have been developed to reproduce the contractility and electrophysiological properties of the native heart. However, the lack of structural complexity limits these models for pump-like cardiac functions. Recently, the use of 3D bioprinting has been reported to facilitate the creation of chamber-like cardiac tissues. Although these models mimic the chamber-like geometries, they exhibit poor pressure-volume dynamics. Myocardial fiber orientation is a critical structural feature of the native heart for increasing cardiac function. In this context, we have investigated how to modulate the orientations of cardiac tissue, mimicking the cardiac structure. Tissue assembly is a method of creating larger or more complex constructs based on tissue units, and we applied 3D bioprinting for rapid prototyping of tissue units. We generated EHT units that exhibited cellular alignment that recapitulates a bundle of myocardial fibers, and they reproduced native cardiac functions. Sequentially, the units were assembled to modulate fiber orientations, and the assembled EHT was proved to show synchronized contraction and electrophysiological properties. These results will be further advanced to build the cardiac chamber with myocardial orientation.