KSPE 사단법인 한국정밀공학회
Korean Society for Precision Engineering

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한국정밀공학회 2019

# 춘계학술대회

## KSPE 2019 SPRING CONFERENCE

2019. 5. 15 수 ~ 17 금 라마다프라자제주호텔

[주최] KSPE 사단법인 한국정밀공학회 Korean Society for Precision Engineering

[후원] KOFST 한국과학기술단체총연합회 / Jeju 제주특별자치도 / Jeju CVB Jeju Convention & Visitors Bureau 사|제주컨벤션뷰로 / SAMSUNG 삼성전자

이 발표논문집은 정부재원(과학기술진흥기금 및 복권기금)으로 한국과학기술단체총연합회의 지원을 받아 발간되었음
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19SPP445 수소저장합금 모듈의 온도제어를 통한 재활시스템용 구동부 개발에 관한 기초 연구
유창호(전북대학교), 신미연(전북대학교)

19SPP446 실시간 탄성 및 타이밍제어 발목의지
최환(University of Central Florida), 브라이언 하울(University of Central Florida)

19SPP447 자이로센서와 가속도센서를 이용한 본태성 진전의 측정
김지원(건국대학교), 권도영(고려대학교), 문기욱(옴니버스)

19SPP448 음파진동시간에 따른 슬링 운동이 하지 장애인의 등속성 근기능에 미치는 영향
우현지(전북대학교), 권대규(전북대학교), 오주환(전북대학교), 홍철운(전북대학교)

19SPP449 도약 자세 이미지 분석을 통한 도약력 예측
남윤형(서울대학교), 김도년(서울대학교), 도영경(서울대학교)

## 적층제조시스템

19SPP476 촉각센서 신호처리 안정화를 위한 재료 합성에 관한 연구
윤해룡(한국로봇융합연구원), 김대희(한국로봇융합연구원), 우성용(한국로봇융합연구원), 조용준(한국로봇융합연구원)

19SPP477 레이저 컷팅을 활용한 FDM 시편 제작 방법에 대한 연구
박성제(한국생산기술연구원), 박석희(한국생산기술연구원), 이지은(한국생산기술연구원), 손용(한국생산기술연구원), 박진호(한국생산기술연구원), 이낙규(한국생산기술연구원)

19SPP478 주석합금와이어를 이용한 클래딩 공정의 기초 실험
김찬규(창원대학교), 조영태(창원대학교)

19SPP479 비정형 건축 부재 3D Printer 용 로딩 장치 개발에 대한 연구
박건우(고려대학교), 홍대희(고려대학교), 심준혁(고려대학교), 김학민(고려대학교), 김찬우(고려대학교)

19SPP480 3D 프린팅용 중공형 Glass bead를 함유한 열가소성 복합소재의 개발
최재혁(광주대학교), 이필호(한국기계연구원), 이상원(성균관대학교), 김정섭(성균관대학교), 이창수(성균관대학교), 김성민(성균관대학교), 정하승(Michigan State University)

19SPP481 비조립식 3자유도 힘 센서
구민석(한양대학교), 조남규(한양대학교), 백상우(한양대학교), 정덕원(한양대학교), 황인오(한양대학교)

19SPP482 허혈성 심장 질환 치료를 위한 주입식 줄기세포 유래 스페로이드 제조
박예진(POSTECH), 장진아(POSTECH), 용의중(POSTECH), Sanskrita Das(POSTECH)

19SPP483 DED 3D프린팅 출력제어 공정의 적층 특성 분석 연구
이동목(맥스로텍), 박준혁(맥스로텍), 최규철(맥스로텍)

19SPP484 유한요소해석을 통한 두께에 따른 PDMS의 기계적 특성 연구
이인환(충북대학교), Chaima Fekiri(충북대학교)

19SPP485 선택적 레이저 용융 공정으로 제조한 CoCr 소재의 미세조직 및 마모 특성 연구
정경환(한국생산기술연구원), 이강표(한국생산기술연구원), 김강민(한국생산기술연구원), 강석현(한국생산기술연구원)

19SPP486 355 nm 나노초 펄스 레이저기반의 유연하고 민감한 스트레인 센서제작에 관한 연구
정성엽(부산대학교), 신보성(부산대학교), 마용원(부산대학교), 유동빈(부산대학교), 윤단희(부산대학교)

**KSPE 2019 정밀 공학회 (5/15 ~ 5/17)**

# 허혈성 심장 질환 치료를 위한 주입식 줄기세포 유래 스페로이드 제조

# Biofabrication of Injectable Stem Cell-laden Spheroids for the Treatment of Ischemic Heart Diseases

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Key words: 3D bioprinting, ischemic heart diseases, decellularized extracellular matrix, stem cell-laden spheroid, tissue engineering

Ischemic heart disease remains the leading cause of death in worldwide for several decades. It is classified as an incurable disease due to the limited regenerative capability of the ischemic tissues. Although stem cell therapy has emerged to overcome this disease, it has limitation about low rate of adhesion and differentiation of transplanted cells. In this study, three-dimensional spheroids including human c-kit+ mesenchymal stem cells and endothelial progenitor cells were fabricated by using 3D bioprinting technique. Bioink, mixture of heart decellularized extracellular matrix (hdECM), stem cells, and alginate, was prepared and was dropped and cross linked in a dish which is containing calcium chloride in a programmed manner. Optimal composition ratios were found by varying the composition of the materials to be mixed, and various sizes of spheroids were produced by changing the parameters such as pneumatic pressure, pressure time, and nozzle size. Also, predominant green fluorescence evidenced dominated population of live cells and clearly indicates that cells were viable and environment in the spheroid was biocompatible niche condition. It is expected that this can be used in the future to prevent or treat heart-related diseases.

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# 한국정밀공학회 2019 춘계학술대회

## - 허혈성 심장 질환 치료를 위한 주입식 줄기세포 유래 스페로이드 제조 -

## - Biofabrication of Injectable Stem Cell-laden Spheroids for the Treatment of Ischemic Heart Diseases -

**(May 15, 2019 – May 17)**

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**Abstract**

Ischemic heart disease remains the leading cause of death in worldwide for several decades. It is classified as an incurable disease due to the limited regenerative capability of the ischemic tissues. Although stem cell therapy has emerged to overcome this disease, it has limitation about low rate of adhesion and differentiation of transplanted cells. In this study, three-dimensional spheroids including human c-kit+ mesenchymal stem cells and endothelial progenitor cells were fabricated by using 3D bioprinting technique. Bioink, mixture of heart decellularized extracellular matrix (hdECM), stem cells, and alginate, was prepared and was dropped and cross linked in a dish which is containing calcium chloride in a programmed manner. Optimal composition ratios were found by varying the composition of the materials to be mixed, and various sizes of spheroids were produced by changing the parameters such as pneumatic pressure, pressure time, and nozzle size. Also, predominant green fluorescence evidenced dominated population of live cells and clearly indicates that cells were viable and environment in the spheroid was biocompatible niche condition. It is expected that this can be used in the future to prevent or treat heart-related diseases.

**Conclusion**

- Spheroid fabrication was developed using 3D printing technology.
- The printing condition was biocompatible.

**Reference**

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