

2024 IEEE International Conference on Flexible and Printable Sensors and Systems (FLEPS 2024)

**Tampere, Finland
30 June - 3 July 2024**



**IEEE Catalog Number: CFP24T72-POD
ISBN: 979-8-3503-8327-0**

**Copyright © 2024 by the Institute of Electrical and Electronics Engineers, Inc.
All Rights Reserved**

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

****** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP24T72-POD
ISBN (Print-On-Demand):	979-8-3503-8327-0
ISBN (Online):	979-8-3503-8326-3
ISSN:	2832-8248

Additional Copies of This Publication Are Available From:

Curran Associates, Inc
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: (845) 758-0400
Fax: (845) 758-2633
E-mail: curran@proceedings.com
Web: www.proceedings.com

CURRAN ASSOCIATES INC.
proceedings
.com

TABLE OF CONTENTS

Ammonia Sensors Based on Polyaniline: Materials Processing as Leverage for Performance Optimization.....	1
<i>Caroline Duc, Edilene Assunção Da Silva, Maria L. Braunger, Nathalie Redon</i>	
Flexible Electrodes Coated with Carbon Quantum Dots Derived from Spent Coffee Grounds for Electric Double-Layer Capacitors	5
<i>Grishika Arora, Nuur Syahidah Sabran, Hieng Kiat Jun</i>	
A Sub-NW Temperature Invariant Voltage Reference in a Unipolar TFT-based Flexible IC Technology	9
<i>Dipesh C. Monga, Kari Halonen</i>	
Flexible and Printed Interdigitated Electrodes for Field Ice Detection Using Electrochemical Impedance Spectroscopy	13
<i>Alazne Martinez, Borja Pozo, Mikel Larrañaga, Cristina Monteserín, Iban Quintana, Jone M. Ugartemendia</i>	
Printable Transparent Conductive Ink for Dielectric Elastomer-Based Tunable Acoustic Absorber.....	17
<i>Milan Shrestha, Leonardus Depari, Edwin H. T. Teo</i>	
Monolithic Supercapacitors Prepared by Roll-To-roll Screen Printing	21
<i>Timo Punkari, Aapo Kattainen, Alexandre Fonseca, Joana Pronto, Jari Keskinen, Matti Mäntysalo</i>	
Dopamine Functionalized Activated Carbon-Based 3D Printed Biodegradable Electrode for Supercapacitors	25
<i>Chirag Mevada, Vijay Singh Parihar, Jari Keskinen, Minna Kellomäki, Matti Mäntysalo</i>	
Exploiting Stiff PDMS Islands to Enhance Stretchable Printed Circuit Boards.....	29
<i>Christoph Lehmann, Armin Jamali, Karthika Sheeja Prakash, Shekinah Winnerman Agbozo, Laura M. Comella</i>	
An Extrusion Printed Capacitively Interrogated DC Electric Field Sensor.....	33
<i>Desmond Lagace, Tao Chen, Cyrus Shafai</i>	
The Influence of Parylene-C Coating on the Performance of Printed and LIG Heaters.....	37
<i>Lukas Rauter, Johanna Zikulnig, Lukas Neumaier, Jaroslaw Kaczynski, Giovanna Grosso, Wolfgang Mühleisen, Marvin Schreiter, Markus Aigner, Jürgen Kosel</i>	
Capillary Printing of Fine Structures on Flexible and Hybrid Substrates.....	41
<i>Achille Guitton, Marc Pascual, Kristina Farmand, Maroua Ben Haddada, Nathan Bigan, Sahar Al Kamand, Amin M'Barki</i>	
Highly Stretchable, 3D Printable Ionically Conductive Organohydrogel for Long-Time Stable Strain Sensors	45
<i>Giorgio Mogli, Annalisa Chiappone, Ignazio Roppolo, Stefano Stassi</i>	
A Custom-Designed Atrial Fibrillation Detection Hardware on a Flexible Substrate	49
<i>Emre Ozer, Jędrzej Kufel, Elena Punskeya, Igor Drovkov, Ari Ercole, Hiral Radia, Thom Smith, John Biggs, Francisco Rodriguez, Grace Aligada, Adam Rearden</i>	

Characterisation of 3D Printable Material for an Acoustic Metamaterial Cell with Tuneable Resonance.....	53
<i>Alicia Gardiner, Roger Domingo-Roca, Mahshid Hafezi, James Windmill, Andrew Feeney</i>	
Artificial Compound Eye Camera for Wide Field of View and High-Resolution Imaging	57
<i>Sehui Chang, Young Min Song</i>	
Flexible Shielded Sensors Based on Biocompatible Ferroelectrets for Heart Rate Monitoring	61
<i>Alexander A. Altmann, Sven Suppelt, Bastian Latsch, Omar Ben Dali, Jan Helge Dörsam, Daniel G. E. Thiem, Mario Kupnik</i>	
Hybrid Sensor Insole for Wearable Ballistocardiography in Remote Health Monitoring	65
<i>Bastian Latsch, Omar Ben Dali, Benedikt Hench, Romol Chadda, Youssef Sellami, Alexander A. Altmann, Niklas Schäfer, Julian Seiler, Mario Kupnik</i>	
Solid State Electrolyte to Enable Structural Supercapacitors	69
<i>Nandu Koripally, Lulu Yao, Jason D. Azoulay, Tse Nga Ng</i>	
Copper-Based Pairs Modulation for High-Sensitivity H ₂ S Detection in In ₂ O ₃ NPs Sensor.....	73
<i>Ahmad Al Shboul, Ricardo Izquierdo</i>	
Wearable Sensor-Enabled Meat Packaging for Freshness Monitoring and Assurance	77
<i>Ahmad Al Shboul, Ricardo Izquierdo</i>	
Low-Temperature Fabrication of Mesoporous SiO ₂ CBRAM Memory Cells on Flexible Substrates	81
<i>Roxane Mamberti, Evangéline Benevent, Marc Bocquet, Jérémy Postel-Pellerin, David Grosso, Cédric Djaou, Magali Putero</i>	
Design and Fabrication of a Flexible Sensory System for Tongue Pressure Measurement in Swallowing Disorder Diagnosis	85
<i>Julian Quevedo, Ruben Roberts, Jonatan Flores, Reza Kamali-Sarvestani</i>	
Carbon-Ink Sensing Patterns for a Contactless Smart Diaper System.....	88
<i>Joryan Sennesael, Arno Moerman, Hendrik Rogier, Patrick Van Torre</i>	
Printed Temperature Sensors on Paper with Aerosol Jet Printing Technology	92
<i>Elise Bessac, Bilal Demir, Nadège Reverdy-Bruas, Anne Blayo</i>	
Flexible Thermochromic Displays	96
<i>Aki Halme, Teemu Salo, Jukka Vanhala</i>	
Multiphysics Simulations of Cyclic Voltammetry Response of Flexible Screen-Printed Electrodes for Wearable Sensing Systems.....	100
<i>L. Franchin, M. Ploner, A. Altana, B. Shkodra, M. A. Costa Angeli, P. Lugli, L. Petti, A. Paccagnella, S. Bonaldo</i>	
Edible Transistors: from Fabrication to Tips for Storage	104
<i>Elena Feltri, Valerio Galli, Fabrizio Mario Ferrarese, Alessandro Luzio, Mario Caironi</i>	
Optical Sensing of Water Contaminants Using Organic Semiconductors	108
<i>Sagarika Mishra, Edward B Ogugu, Graham A Turnbull, Ross N Gillanders</i>	
Flexible Screen-Printed Temperature Sensor for Active Regulation onto Screen-printed Heater	111
<i>Maxime Wawrzyniak, Lamiae El Bourkadi, Marion Peyrard, Aziz Rezig</i>	
Measurement of Temperature in Parallel Channel of Microfluidic Reactors	115
<i>Abdullah Khan, Morgan Regnier, Dušan Kopecky</i>	

Enhancement of Stability to Light in Field-Effect Transistors Based on Cumulenic sp-carbon Wires by Opaque Gating Electrodes	119
<i>Elda Sala, Valerio F. Annese, Bozheng Sun, Rik R. Tykwinski, Carlo S. Casari, Mario Caironi</i>	
Investigation of Solution Processable Moisture Barrier Films Based on a Polymer and Filler Materials	123
<i>Zehua Chen, Ulrich Gengenbach, Shant Gananian, Daniel Moser, Klaus-Martin Reichert, Liane Koker</i>	
Integrated Piezoresistivity and Frequency Modulation for High-Sensitivity Printed Capacitive Strain Sensing	127
<i>Hassan A. Mahmoud, Hussein Nesser, Gilles Lubineau</i>	
Flexible RF to DC Converter for Wireless Power Transfer in NFC and Biomedical Systems	131
<i>Dipesh C. Monga, Kari Halonen</i>	
Carbon Nonwoven RFID Antennas for Smart Wearable Applications	135
<i>Teemu Salo, Tiina Vuohijoki, Asif Shaikh, Johanna Virkki, Jukka Vanhala</i>	
Integrated PMUTs on Elastic Substrate for Wearable Applications	139
<i>Teuvo Sillanpää, Abhilash Sebastian Thanniyil, Timo Kurkela, Konsta Airola, Panu Helistö, Jyrki Ollila, Cyril Baby Karuthedath, Mohammad H. Behfar</i>	
One Step Towards Secure Identification in Wireless Body Area Networks (WBANs): Intelligent Insole Sensor Systems	143
<i>Jan Herbst, Lea Bergkemper, Christian Fahldieck, Christoph Lipps, Arata Jingu, Jürgen Steimle, Hans D. Schotten</i>	
Screen-Printing Resistive Temperature Sensor Development with Sustainable Carbon Pastes	147
<i>Leire Sanchez-Duenas, Cristina Monteserin, Estibaliz Gómez, Miren Blanco, Mikel Larrañaga, Estibaliz Aranzabe, Miryam Criado-Gonzalez, Rajat Rai, José Luis Vilas-Vilela</i>	
Improving Soft Capacitive Tactile Sensors: Scalable Manufacturing, Reduced Crosstalk Design, and Machine Learning	151
<i>Gidugu Lakshmi Srinivas, Sherjeel Khan</i>	
Electrohydrodynamic Printing of High Aspect Ratio Conductive Structures	155
<i>Robin Kaufhold, Sherjeel Khan, Jurgen Kosel, Jasmin Aghassi-Hagmann</i>	
Non-Planar Printing for Stretchable Tactile Sensors	159
<i>Sonja Groß, Michael Tim Braun, Amartya Ganguly, Sami Haddadin</i>	
Wearable On-Skin Chemo-sensors	163
<i>Le Yang</i>	
Ultra-Low-Power Front-end Design on Flexible IC Technology for Capacitive Sensors	164
<i>Muhammad Tanweer, Dipesh C. Monga, Kari Halonen</i>	
Optical Neuromorphic Modulators Based on Tamm Plasmon Resonators with PEDOT:PSS	168
<i>Young Min Song, Joo Hwan Ko, Dong Hyun Seo</i>	
Investigation of Reliability of a Polypyrrole Coated Conductive Cotton Fabric for Sensing Applications	171
<i>Anis Fatema, Saurabh B. Mishra, Aftab M. Hussain</i>	
Roll-To-roll Laser and Printing Processes for Double Sided Printed Electronic Systems	175
<i>Thomas M. Kraft, Elina Hakola, Marja Valimaki, Tuomas Happonen</i>	

Organic Bioelectronic Sensors for Point-Of-care Diagnostics	178
<i>Anna-Maria Pappa</i>	
Modelling and Optimization of a Wearable Thermoelectric Cooler.....	179
<i>Yuzhen Zhang, Panagiotis Kassanos</i>	
Transient Thin-Film Zinc Based Sensor on Flexible Nettle-Gelatin Coated Fabric	183
<i>Albert Heinrich Lanthaler, Alejandro Carrasco-Pena, Soufiane Krik, Niko Münzenrieder, Giuseppe Cantarella</i>	
Edible Electronics: Prospects for Future Biosensing Technologies.....	187
<i>Alessandro Luzio, Mario Caironi</i>	
Flexible Inductive Pressure Sensor Array.....	188
<i>Alexander Johnson, Nimal Jagadeesh Kumar, Niko Münzenrieder</i>	
Flexible 3D Printed Ferroelectret Sensors Integrated into Smart Textiles for Unobtrusive Monitoring.....	192
<i>Alexander A. Altmann, Fatma Souissi, Omar Ben Dali, Sven Suppelt, Bastian Latsch, Jan Helge Dörsam, Sergey Zhukov, Dennis Flachs, Mario Kupnik</i>	
Evaluation of Polypyrrole-Coated Conductive Yarn for eTextile Applications - Embroidered RFID Antennas.....	196
<i>Mustasin Mahmood Sakif, Tiina Vuohijoki, Johanna Virkki, Matteo Iannacchero, Pedro Silva, Jaana Vapaavuori</i>	
Flexible Carbon-Based Electrodes for Amperometric Biosensor Development.....	200
<i>Angelo Tricase, Verdiana Marchianò, Eleonora Macchia, Reshma Kidayaveetil, Donal Leech, Gaetano Scamarcio, Gaetano Perchiazzi, Luisa Torsi, Paolo Bollella</i>	
Thin-Film Thermistor Temperature Sensors on Animal-Based Substrates.....	204
<i>Niloofar Saeedzadeh Khaanghah, Soufiane Krik, Hugo De Souza Oliveira, Alejandro Carrasco-Pena, Manuela Ciocca, Luisa Petti, Michael Haller, Giuseppe Cantarella, Niko Münzenrieder</i>	
Direct-Write Patterning on Flexible Substrates Using Scanning Probe-based Electrolithography Technique	208
<i>Swapnendu Narayan Ghosh, Santanu Talukder</i>	
Fabricating Ultrathin Piezoelectric Sensors in Ambient Conditions with Low Operation Voltage	212
<i>Ninja Kajias, Amit Tewari, Leena Ukkonen, Veikko Surakka, Matti Mäntysalo</i>	
Temperature Sensors on Recyclable Vitrimer Substrates	216
<i>Deepa Bhatt, Tinatin Kouprava, Soufiane Krik, Albert Heinrich Lanthaler, Pierre Verge, Daniel F. Schmidt, Niko Münzenrieder, Giuseppe Cantarella</i>	
Surface Modification of PDMS Thin Films for Printing Conductive Ink	220
<i>Zachary Sholzberg, Ahmed Mahmoud, Edin Huskic, Pierre-Luc Girard-Lauriault, Sharmistha Bhadra</i>	
Channel Length Scaling of Solution-Processed Single-Walled Carbon Nanotube Thin-Film Transistors	224
<i>Edin Huskic, Zachary Sholzberg, Sharmistha Bhadra</i>	
Flexible Enzyme-Based Fuel Cell Integrated with Hydrogel Electrolyte.....	228
<i>Angelo Tricase, Verdiana Marchianò, Eleonora Macchia, Reshma Kidayaveetil, Dónal Leech, Matteo Piscitelli, Gaetano Scamarcio, Luisa Torsi, Paolo Bollella</i>	

Sensing by Instrumented 3D Printed Pessary	231
<i>Dimitrios Kosmas, Momen Abayazid, Gijs Krijnen</i>	
Improving Zero-Voltage Photo Detection in Flexible OPDs with a PFN-Br Electron Transport Layer.....	235
<i>Hossein Anabestani, Sharmistha Bhadra</i>	
Sustainable Temperature and Pressure Sensor for Tire.....	239
<i>Kimmo Keränen, Timo Kurkela, Jyrki Ollila, Marko Korkalainen, Antti Tanskanen, Antoine Balin, Arne Buchholz, Anbarasan Mani</i>	
A Novel e-Gear Selector Based on Triboelectric Nanogenerators (TEGs) for Automotive Applications.....	243
<i>S. Ali, D. Maddipatla, B. J. Bazuin, M. Z. Atashbar</i>	
Stretchable Strain Sensor: Characterization and Applications.....	247
<i>Giuseppe Longo, Rosalba Liguori, Luigi Di Benedetto, Gian Domenico Licciardo, Alfredo Rubino</i>	
Hydrothermally Grown Ferroelectric Film-Based Flexible Sensor with Specific Hysteresis Signal Patterns for Detecting Stretch and Bending Motions	251
<i>Guo-Hua Feng, Chih-Ting Yeh</i>	
Crack Preserving Effect in Ultrathin Metal Films on Elastomer Membranes Induced by E-Beam Irradiation	255
<i>Benjamin Sittkus, Julien Petit, Gerald Urban, Ulrich Mescheder</i>	
Conductance Based First Layer Monitoring for Fused Filament Fabrication.....	259
<i>Heime Jonkers, Robin Reichardt, Stefano Stramigioli, Gijs Krijnen</i>	
High-Performance Flexible Heaters with Optimum Laser Induced Graphene Parameters	263
<i>Faizan Tariq Beigh, Nadeem Tariq Beigh, Dhiman Mallick</i>	
Multi-Gate Transistors on Flexible Substrates as Building Blocks for Neuromorphic Electronic Skin.....	267
<i>João Neto, Abhishek Singh Dahiya, Ayoub Zumeit, Adamos Christou, Ravinder Dahiya</i>	
3D Printed Interconnects for Heterogenous Integration on Flexible Substrates.....	271
<i>Sihang Ma, Abhishek Singh Dahiya, Adamos Christou, Ravinder Dahiya</i>	
THz Spectroscopy Analysis of Crystallinity Optimization for Enhanced Piezoelectricity in Biodegradable Poly-L-Lactide Acid	275
<i>Youssif Merhi, Yasith Amarasinghe, Vincent O. Y. Goumarre, Karem Lozano Montero, Matti Mantysalo, Pernille K. Pedersen, Shweta Agarwala</i>	
Screen-Printed Conductive Biodegradable Ink for Application in Flexible Transient Electronics.....	279
<i>Mahboubeh Motadayen, Shweta Agarwala</i>	
Biodegradable Temperature Sensor Enabled Using Printed Electronics	283
<i>Julia Paulina Bartnik, Devabharathi Nehru, Mahboubeh Motadayen, Shweta Agarwala</i>	
Screen Printed Glassy Carbon: Applications in Printed Electronics and Sensors.....	287
<i>Davide Deganello, Brent De Boode, Ben Clifford, Chris Phillips</i>	
Nano-Manufacturing of Strain-engineered Van Der Waals Materials for Deformable Electronics.....	291
<i>Sungwoo Nam</i>	

Biomimetic Polymer Electronics for Multi-Modal Interfacing with Biology	292
<i>Sihong Wang</i>	
Multispectral Organic Photodetectors and Applications.....	293
<i>Zhuangmiao Wang, Yu Tang, Furong Zhu</i>	
RF-Enabled Flexible and Printed Electronics: A Route to Sustainable Wireless Sensors and Systems: Invited Paper	297
<i>Mahmoud Wagih</i>	
A Portable Single-Molecule Sensitive Bioelectronic System for Disease Diagnosis at the Point-of- Care	301
<i>Marco Fattori, Enrico Genco</i>	
Electrohydrodynamic Printing of Conductive Microstrips on Hyperelastic Substrates for Fabrication of Flexible and Stretchable Sensors.....	303
<i>Nadine Philippin, Ingo Kuehne, Gabriele Schrag</i>	
Electronic Textile Printing for Sensing Wearables	307
<i>Julia Guerineau, Jollan Ton, Merieme Bassaoui, Mariia Zhuldybina</i>	
2.45 GHz Silicone-Based Rectenna: Manufacturing Techniques and Design	311
<i>F. Benassi, F. Vender, L. Agostini, C. Scagliarini, G. Paolini, D. Masotti, R. Vertechy, A. Costanzo</i>	

Author Index