

TITLE: FlexFab: A Core Facility for Additive Manufacturing of Polymeric Components and Embedded Electronics For Smart Sensing, Controls, and IOT¹ Applications

Lead contacts for RDF Application:

Name: Balakrishna Haridas¹, FlexFab Director | Duncan Maitland¹, FlexFab Deputy Director

Department Biomedical Engineering

Email address bharidas@tamu.edu; dmaitland@tamu.edu

Phone number 513-235-7861

Co-PIs : Taylor Ware¹, Melissa Grunlan¹, Gerard Cote¹, Alaa Elwaany², Satish Bukkapatnam², Cynthia Hipwell³, Arun Srinivasa³, Prabhakar Pagilla³, Svetlana Sukhishvili^{5,17}, Mary McDougall¹, Roozbeh Jafari⁶, Sung IL Park⁶, Limei Tan¹, Moble Benedict⁷, Rod Pettigrew⁹, Debjyoti Banerjee³, Michael Moreno⁹, Chris Seets³, Carl Gregory⁴, Samba Reddy¹⁰, John Criscione⁹, Ravi Kumar Majeti¹¹, Larry Suva¹², Brian Saunders¹², Alex Thomasson¹³, Suresh Pillai^{14,16}, Carol Lafayette¹⁵, Georgianne Moore¹⁵, Matt Pharr³, Sorin Popescu¹⁵

¹Biomedical Engineering, ²Industrial & Systems Engineering, ³Mechanical Engineering, ⁴Molecular and Cellular Medicine (HSC), ⁵Materials Science and Engineering, ⁶Electrical & Computer Engineering, ⁷Aerospace Engineering, ⁸College of Medicine, ⁹EnMED, ¹⁰Neuroscience & Expt Therapeutics, ¹¹College of Pharmacy, ¹²Veterinary Medicine and Biomedical Sciences, ¹³Biological and Agricultural Engineering, ¹⁴Nutrition & Food Science, ¹⁴Architecture (Visualization), ¹⁵Ecosystem Science & Management, ¹⁶Nat Ctr for EBeam Research, ¹⁷Soft Matter Facility

Key Participating Units: CoE/TEES, AGLS Vet Med/Biomedical Sciences, CoM/HSC, EnMED, ARCH, Pharmacy
Executive Committee (EC): Cynthia Hipwell (CoE/TEES), Brian Saunders (Vet Med), Karen Wooley (CoS), Bala Haridas (CoE/TEES), Carl Gregory (HSC), Satish Bukkapatnam (CoE/TEES IMS), Suresh Pillai (AGLS)

Oversight Committee (OC): Department Heads & Research Deans of CoE, CoS, CoM, AGLS.

Request Amount (\$): ~\$2,316,813.00

Executive summary: Advances in additive manufacturing of polymeric products are driving a manufacturing revolution where custom designs, complex geometries, functionally graded lattices, and high-quality surface finish can be produced at high volumes. Concurrently, new fabrication technologies for embedding electronics directly onto devices are inspiring the 21st century digital/AI transformation for *smart sensing, controls, and IOT communications*. Unfortunately, researchers at A&M lag in these capabilities since existing manufacturing and prototyping methods do not yield devices with these capabilities. This significantly limits A&M researchers w.r.t competing & winning large interdisciplinary translational research grants, public-private research partnerships, and pursuing impactful applied research. We propose to use RDF funds to purchase equipment and establish **FlexFab** to enhance the ability of A&M researchers towards obtaining substantial extramural funding, publish quality translational research & intellectual property towards products that benefit society. FlexFab will support **pre-planned and Just-In-Time (JIT) fabrication**, cleaning, packaging, and sterilization (as needed) of production quality digitally enhanced devices for a number of applications - *Medical Devices (Human & Veterinary), Military Systems, Advanced Materials, Robotics, Automotive, Aerospace, Transportation, Smart Infrastructure/Security, Agriculture (Water-Sustainability-Food-Diseases-Land Use), Consumer Products, Energy Systems, and Disaster Preparedness/Medical Countermeasures*. FlexFab PI (Haridas) has ~28 years of industry/academic experience establishing and managing R&D infrastructure, manufacturing, and commercial launches. At Texas A&M, as PI of the FDA Pediatric Devices Consortium, he has acquired polymeric device manufacturing capabilities some of which are being donated to FlexFab. Co-PI Maitland has conceptualized, designed, built and commercialized implantable biodegradable medical devices using some of the donated and in-kind resources described in the proposal. He has 30+ years of experience with commercializing products based on academic research.

¹ Internet Of Things