PURDUE INNOVATES | Office of Technology Commercialization

Phase Transforming Cellular Matrix (PXCM) based Tile Design for Lightweight Runway Mat

Phase transforming cellular matrix textiles enable the rapid deployment of lightweight, durable runway panels and structures that significantly outperform current fatigue life standards.

Researchers at Purdue University have developed a new phase transforming cellular matrix (PXCM) based panel design to develop durable, light-weight runways for aircraft takeoff and landing. A runway was created using PXCM textiles and in testing showed no signs of failure in over 5,000 cycles with varying dynamic loads over the course of 60 days. Current runway technology only lasts 750-2,056 passes. The PXCM textiles fine-tuned by Purdue researchers exhibit excellent elasticity, are assembled through a simple hexagon laying pattern, and mimic foam in porosity to allow for minimal weight.

Technology Validation: This technology has been validated by subjecting the paneling to a hard-brake test with a 4-ton truck. After five rounds of testing, minimal change in the structure of the panels was observed. The panels were also subjected to 50 cycles of bending tests which showed no material failures, and the material recovered from the repetitive deformation.

Advantages:

-Lightweight, durable construction

-Easily connected into structures or sheets

-Can absorb shocks and unexpected high loads (e.g., aircraft coming at a higher vertical velocity than those recommended, etc.). Increase fatigue life.

Applications:

-Deployable aircraft runways

Technology ID
2020-ZAVA-69072

Category
Infrastructure & Construction/Structural Health Monitoring
Materials Science & Nanotechnology/Composites & Hybrid Materials

Authors
Scott Hartford
Kristiaan Hector
Pablo Zavattieri

Further information
Dipak Narula
dnarula@prf.org

View online

-Landing pads for other flying objects (drones, helicopters, etc.).

-Game/entertainment floors

-Rapidly deployed structures/buildings (e.g., for disaster emergencies, etc.)

Related Publications:
https://www.purdue.edu/newsroom/releases/2020/Q3/sbir-grant-fast-tracks-3d-printed-runway-mat-development.html

TRL: 6

Intellectual Property:

Provisional-Gov. Funding, 2020-07-01, United States | Utility-Gov. Funding, 2021-04-30, United States | CIP-Gov. Funding, 2021-07-21, United States

Keywords: phase transforming cellular matrix, PXCM, durable runways, light-weight runways, PXCM textiles, deployable aircraft runways, rapid deployment structures, landing pads, flexible paneling, enhanced fatigue life, Additive Manufacturing, Aeronautics, Air Vehicle, Aircraft, Automation, Automotive, loading, Manufacturing, Material Development, Materials Science, Materials/Manufacturing Computer Technology, Metastable Materials, Military, phase change, Pneumatics, Tires