WINNER

ENTRY PS18-0020
NextGeneration Multifunctional Composite System for Resilient Infrastructure
The Achilles heel in any structural system performance is the joint, especially in multistory structures subjected to hurricanes, earthquakes and blast loads. A multifunctional composite system invented by researchers at West Virginia University will allow a bridge or building system to resist extreme events while saving thousands of lives by avoiding catastrophe. This system can economically refurbish (~1% of the structure replacement cost) thousands of buildings in California and elsewhere without ripping and replacing, thus reducing the $2 trillion infrastructure funding gap.

Benjamin M. Statler College of Engineering and Mineral Resources/West Virginia University – Praveen K.R. Majjigapu; Hota V.S. GangaRao; Ruifeng R. Liang

FIRST RUNNER UP

ENTRY PS18-0023
Carbon Nanotube-Based Novel Flexible Sensors for Human Motion Analysis
A novel manufacturing process is used for creating thin flexible carbon nanocomposite films to create piezoresistive fabrics using everyday fabrics such as Kevlar, Cotton, and Polyester. The flexible sensors have a variety of applications in prosthetic devices, smart garments, e-skins for robot and pressure sensing skins. Applications for detecting joint motion at the knee during walking, standing/sitting processes is discussed. Low-cost customized smart footwear is created by integrating multiple sensors in the sole of the footwear and used for detecting gait imbalances. The sensors response is validated using state-of-the-art force plates.

University of Delaware – Sagar M. Doshi; Amit Chaudhari; Collene Murray; Prof. Erik Thostenson

SECOND RUNNER UP

ENTRY PS18-0017
Carbon Fibre Reinforced Phenolic Composites with Near 100% Recyclability Through Dynamic Boronic Ester Bonds
Both environmental and economic factors have driven the development of recycling routes for the increasing amount of composite waste. The goal of this work is to create reversible thermosets using dynamic boronic ester bonds as cross-links instead of traditional irreversible covalent bonds. By combining the reprocessability of thermoplastics with desirable thermal stability of thermosets, controlled degradation and fully recycling of carbon fibre-reinforced polymer (CFRP) composites at ambient condition were realized through gentle alcoholysis. The multiple recycling experiments revealed near-total recovery of the clean fibre and binder materials, which could be reprocessed into composites with similar mechanical properties as fresh materials.

Xi'an Jiaotong University – Shujuan Wang; Xinli Jing; Xiaolong Xing; Xiaoting Zhang

THIRD RUNNER UP

ENTRY PS18-0027
Lightweight Carbon Nanotube Conductor with High Electrical Conductivity for Scale-up Manufacturing and Conductive Fibre-Reinforced Composite Application Study
In this work, a macroscopic continuous stretched CNT sheet with high electrical conductivity was made with large dimensional width (around 9 mm) and thickness (around 30 µm). Using chemical doping of iodine and capping layer of PEDOT:PSS, the macroscopic aligned CNT sheet shows high electrical conductivity in the range of 10,000 S/cm and this excellent performance is stable in open air.

Florida A&M University and Florida State University, College of Engineering – Songlin Zhang; Dr. Jin Gyu Park; Nam Nguyen; Dr. Ayou Hao; Dr. Richard Liang