

S. M. Sapuan

University Putra Malaysia, Malaysia

New Insights in Natural Fibre Composites Research: Performance, Conceptual Design, Materials Selection and Design for Sustainability

Natural fibres have been one of the most interesting research topics over the past 20 years as the potential substitution for the synthetic fibre composites. This might be attributed to their excellent properties, such as low cost of production, renewability, biodegradability and availability compared to synthetic fiber composites. Some of the natural fibres that have been used for reinforcing polymer biocomposites include sugar palm, banana pseudo-stem, bamboo, kenaf, jute, hemp, oil palm, pineapple and sisal. Natural fibre composites or biocomposites can be defined as materials that consist of two or more constituent materials, mainly natural fiber reinforcements and synthetic or bio polymer matrices, bonded together. As a result, better properties are obtained in the final biocomposites compared to the constituent materials. Besides, the interest in polymer nanocomposites using nanocelluloses has been found to be of growing tremendously due to the unique characteristics of those nanomaterials, such as abundant surface –OH groups and their associated ease of surface modification, high strength, thermal and crystallinity, (potentially) low cost and renewability. Natural fiber reinforced polymer composites are emerging very rapidly as the potential substitute to the synthetic fibre polymer composites in different industries such as automotive, building, food packaging, aerospace, marine, sporting goods, furniture, biomedical and electronic industries. Besides, building materials from biocomposites are made from straw in United States. Natural fibercomposites are used in transport industries such as automotive (parcel shelves, door panels, instrument panels, armrests, headrests, seat shells, car bumper beam, under-floor protection for passenger cars, rear view mirror, visor in two wheeler, billion seat cover, indicator cover, cover L-side and name plate), rail (interior paneling for rail vehicles, train seat paneling and door leaves), aircraft (radome, interior and exterior body panels such as in seat cushions, cabin linings, parcel shelves etc.) and marine (hull and deck). Through the substitution of some of the heavier parts with natural fibre composites with high performances can reduce vehicle weight, which in turn lowered the fuel consumption and CO₂ emission. In this lecture, different aspects of natural fibre composites such as performance, conceptual design, materials selection and design for sustainability are addressed.

Biography

S. M. Sapuan is a professor of composite materials and Head of Advanced Engineering Materials and Composites Research Centre, University Putra Malaysia. He earned his B. Eng degree in Mechanical Engineering from University of Newcastle, Australia in 1990, MSc from Loughborough University, UK in 1994 and Ph.D from De Montfort University, UK in 1998. His research interests include natural fiber composites, conceptual design, biobased packaging, materials selection and concurrent engineering. To date he has authored or co-authored more than 1300 publications (over 700 journal papers), books (17), edited books (13), chapters in books (110) and conference proceedings/seminars (700 papers). S. M. Sapuan was the recipient of Rotary Research Gold Medal Award 2012, Alumni Awards, University of Newcastle, NSW, Australia, Khwarizmi International Award (KIA) and 5 Star Role Model Supervisor award by UPM. S. M. Sapuan was recognized as the first Malaysian to be conferred Fellowship by the US-based Society of Automotive Engineers International (FSAE) in 2015. He was the 2015/2016 recipient of SEARCA Regional Professorial Chair. In 2019 ranking of UPM researchers based on the number of citations and h-index by SCOPUS, he is ranked the first. Recently, he was awarded National Book Award, The Best Journal Paper Award, UPM, Outstanding Technical Paper Award, Society of Automotive Engineers International, Malaysia and Outstanding Researcher Award, UPM. He also received Citation of Excellence Award from Emerald, UK, IEEE/TMU Endeavour Research Promotion Award and Best Paper Award by Chinese Defense Ordnance, Malaysia's Research Star Award (MRSA), from Elsevier, Professor of Eminence Award from Aligarh Muslim University, India, Distinguished Researcher Award from INTROP, UPM and Top Research Scientists Malaysia Award from Academy of Science, Malaysia.