EMBEDDED NANOCOMPOSITE SPHERES

FOR SELF-HEALING OF COMPOSITE WIND TURBINE BLADES AND FOR COMPOSITES REPAIR

TECHNOLOGY FIELD

Composites

IP PROTECTION

Patent Pending

RESEARCHER

Dr. Ramazan Asmatulu came to Wichita State University's mechanical engineering program in 2006 with a Ph.D. in Materials Science and Engineering. Recieving tenure and full professorship in 2012, he now teaches graduate level classes in mechanical in engineering and works with PhD and masters students in the composites research labs at WSU. Dr. Asmatulu's main research interests are comprised mainly of nanoparticle technology, especially applications in solar cells, fuel cells, supercapacitors, biodesel production, and laminate and sandwich composites for aircraft.

Composite wind turbine blades are subjected to cyclic loadings, which cause micro and nanoscale cracks and lead to fatigue and failure in a shorter service time. The concept of self-healing technology can be introduced into composite blade manufacturing to increase the lifetime of the blades without human involvement. Nanotechnology is a developing field with tremendous potential for applications in the aerospace and renewable energy industries.

ADVANTAGES

Inspired by biological systems found in nature, the presented technology is a composite impregnated with nano-spheres filled with a healing agent. The composite also contains a catalyst, which increases the curing time of the healing agent. The nano-spheres burst when a micro-crack forms within the composite and releases the healing agent into the micro-crack cavity. When tested, composite panels containing the embedded self-healing nano-spheres increased the tensile strength by over 30% when compared to a standard composite panel.

APPLICATIONS

First used in applications for the aeronautics and wind turbine industries, the self-healing composite increased the lifetime, weight capacity, and strength of the blade, as well as lowering maintenance costs. Industry opportunities for this technology include:

- Aircraft
- Wind Turbine
- Automotive
- Sporting Industry

For additional information,please contact:
Rob Gerlach, Director of Intellectual Property & Technology Transfer
rob.gerlach@wichita.edu | (316) 978-6980

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