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Commonality in Polymer Adhesion

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ABSTRACT:

Asphalt roofing shingles are estimated to cover over 80% of US residential homes; the product's long history, ease of installation and affordable pricing makes their selection an appealing option for both contractors and homeowners. Long-term effectiveness of asphalt-based roofing systems requires that shingle-to-shingle bonding be sufficient to ensure both durability and survivability of the roofing system in high winds. For aerospace structures, composites are increasingly be used in load-bearing components. When composite components are manufactured through layup of uncured tows, the process requires adequate tow-to-tow bonding to minimize defect formation that can degrade the quality of the component and result in expensive r e-manufacturing operations. First, recent studies regarding the adhesion and characterization of the response of an asphalt-based composite material system (bitumen) used in modern asphalt roofing shingle systems are discussed and the devastating damage that occurs when adhesive failure occurs is demonstrated. To quantify the quality of an adhesive bond, a series of double cantilever experiments are performed on asphalt sealant material at three different displacement rates (0.5μm/s, 5μm/s and 50μm/s).

BIOGRAPHY:

Prof. Michael A. Sutton received his Ph.D. in 1981 from the Department of Theoretical and Applied Mechanics at the University of Illinois under the direction of Prof. Charles E. Taylor. Dr. Sutton joined the faculty in the Department of Mechanical Engineering at the University of South Carolina in 1982, becoming one of thirty Carolina Distinguished Professors in 1992 and continuing in this position until 2018 when he was designated a Carolina Research Professor. Prof. Sutton is currently Director of the State Center for Mechanics, Materials and NDE and the Senior Science Officer for Correlated Solutions Incorporated (www.correlatedsolutions.com), the only US developer and supplier of digital image correlation measurement systems. Prof. Sutton has published over two hundred and thirty archival articles. As one of the co-inventors of the digital image correlation method, he has co-authored the only book on image correlation methods, written eight research book chapters, a chapter in a well-known textbook and given numerous international presentations. Prof. Sutton, a Fellow and Past-President of the Society for Experimental Mechanics (SEM) and a Fellow of American Society for Mechanical Engineering (ASME), has received numerous national and international honors for his contributions in the fields of experimental mechanics, computer vision and fracture mechanics. In 2020, Prof. Sutton was elected to US National Academy of Engineering for his contributions. His current areas of research interest include fundamental concepts in 2D and 3D computer vision for deformation measurements, fracture and adhesion mechanics, civil infrastructure measurements, composite material measurements for aerospace manufacturing applications and impact mechanics.