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Three dimensional visualization of voids in fiber reinforced composites using dual energy x-ray computed tomography YASUHITO SUZUKI, BRANDEN KAPPES, DYLAN COUSINS, JOHN DORGAN, Colorado Sch of Mines — Fiber-reinforced composites (FRCs) become more and more common in many applications including automotives, wind turbine blades, and aerospace materials because of their superior mechanical properties. As the superior properties originate from the high strength and high modulus of fibers along the fiber direction, the material is highly anisotropic. Thus, the existence of voids may significantly affect the properties of FRCs. Although acoustic spectroscopy is used as a standard method to detects voids, it does not provide the detailed shape of voids. Here, we demonstrate that the use of dual energy x-ray computed tomography enables us to three dimensionally visualize voids. While conventional x-ray CT scan cannot differentiate air and polymer matrix due to their similar attenuation against x-rays, by using high energy and low energy X-ray, dual x-ray CT scan provides better separation between air and the matrix. Not only spherical voids in the matrix but also irregularly shaped voids because of the physical contact to fibers are visualized. This information can be utilized to optimize the processing conditions and sizing chemistry of the fibers.

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