

Atomic Layer Deposition onto Carbon Fiber Fabrics

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Carbon fiber fabrics, consisting of interwoven bundles of 3000 single fibers, were coated with Al_2O_3 using the atomic layer deposition (ALD) process, exposing the fabrics to alternating pulses of trimethyl aluminium and water vapors. The thickness and uniformity of the coatings were investigated using scanning electron microscopy (SEM) and thermogravimetric analysis (TGA). The obtained coatings were conformal. The area of the fabric was up to $8 \text{ cm} \times 20 \text{ cm}$. By oxidizing the coated fabrics, fabrics composed of interwoven alumina microtubes were obtained. The majority of the fibers were separated from each other and evenly coated even at crossing points.

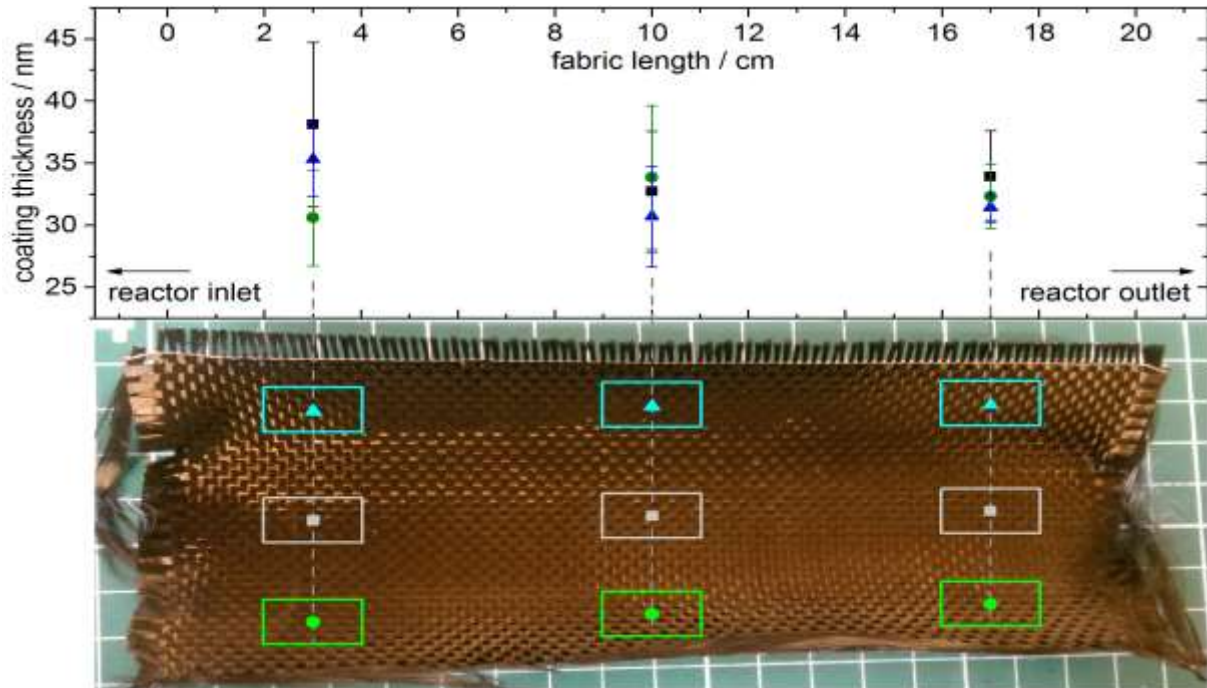


Figure 1. Coating thickness and its standard deviation of an $8 \times 20 \text{ cm}$ fabric, coated with 168 ALD cycles Al_2O_3 , measured via SEM at the positions indicated with the respective symbols and frames in the photograph.

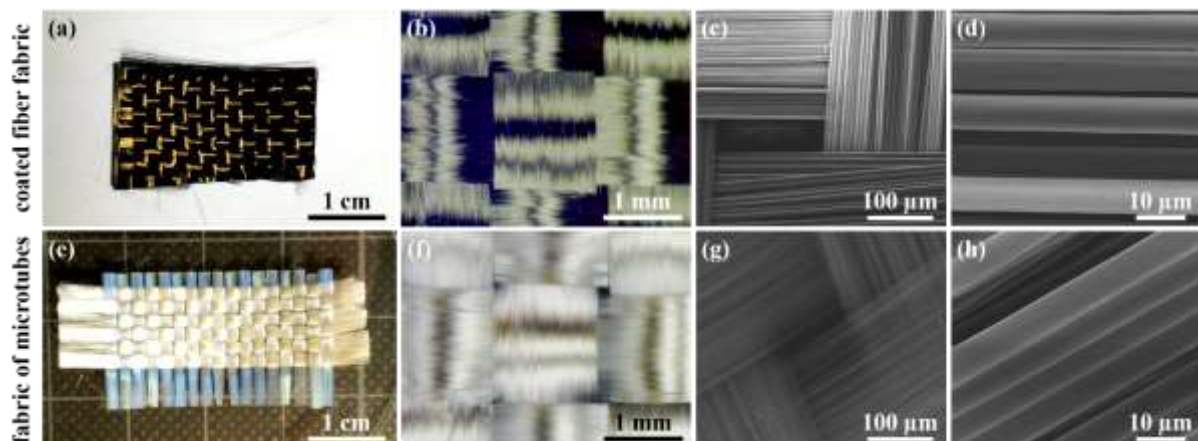


Figure 2. (a-d) Carbon fiber fabric, coated with 168 cycles Al_2O_3 (approx. 40 nm), (e-h) interwoven alumina microtubes obtained via oxidation of coated fabrics. (a, e) photograph, (b, f) reflected-light micrograph, (c-d, g-h) scanning electron micrograph.