Wings of Neurothemis terminata (Dragonfly): A Unique Hydrophobic Nanosculptured Surface Model

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This study explores for the first time the structural and chemical attributes of the wings of a dragonfly found in the Philippines for future biomimetic material development. Male and female Neurothemis terminata wings were collected, identified, preserved, and sent to laboratories for analysis. Morphological assessment was done using scanning electron microscopy (SEM). Energy Dispersive X-ray (EDX) and Fourier Transform Infra-Red (FTIR) spectroscopy were conducted for elemental and chemical bond analysis. Hydrophobicity effect was determined through water contact angle measurement. SEM images revealed polygonal micro-sculptured formations in male and female wings. Micro-sculptured formations were also completely covered with nanoplate–like hairs of less than 100nm. EDX showed that both male and female wings were abundantly composed of carbon and oxygen. FTIR manifested the presence of hydroxyl and carbonyl functional groups. Least Significant Difference test showed higher non–wetting surface in male than in female. The water contact angle ranged 109.67 degrees to 129.00 degrees for male wings and 99.00 degrees to 114.00 degrees for female. Contact angles for glass slides and glass windows were 46.00 degrees to 48.33 degrees and 32.67 degrees to 43.33 degrees, respectively. Data suggested that wings were hydrophobic, and that glass slides and glass windows were hydrophilic. A unique nanosculptured hydrophobic surface was observed in the dragonfly wings. Structures could be reverse engineered and explored for future applications to repel water and dirt on surfaces for easy-cleaning.

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