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Onset time of fog collection using a single wire. YOUHUA JIANG, CHRISTIAN MACHADO, SHAAN SAVARIRAYAN, NEELESH PATANKAR, KYOO-CHUL PARK, Northwestern University — Fog collection is a promising solution to water scarcity while also being of vital importance in industrial processes. To date, many studies have investigated the fog collection rate, a parameter that denotes the average performance over a period of time. However, the initial period (referred to as onset time) between the start of the fog flow and the collection of the captured liquid (a delay in time caused by droplet growth to a critical weight) has not been understood. A longer onset time results in a more serious clogging issue that deteriorates the collection rate and, therefore, understanding this phenomenon is important. Here, we study how the onset time is determined by the capture and transport of fog droplets using single, vertical wires with various surface wettabilities and diameters, under different wind speeds. We derive a scaling law that correlates the onset time with the fog capture process and droplet-surface retention force, governed by aerodynamics and interfacial phenomena, respectively. In particular, the onset time decreases with an increasing rate of fog capture or a decreasing droplet-surface retention. This study introduces a new aspect in the evaluation of fog collection and provides insights for the design of fog collectors.

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