

Abstract Submitted  
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**Spiders Tune Glue Viscosity to Maximize Adhesion**<sup>1</sup> GAURAV AMARPURI, CI ZHANG, CANDIDO DIAZ, University of Akron, BRENT OPELL, Virginia Tech, TODD BLACKLEGDE, ALI DHINOJWALA, University of Akron — Adhesion in humid conditions is a fundamental challenge to both natural and synthetic adhesives. Yet, glue from most spider species becomes stickier as humidity increases. We find the adhesion of spider glue, from five diverse spider species, maximizes at very different humidities, that matches their foraging habitats. By using high-speed imaging we find that the glue viscosity varies over five orders of magnitude with humidity for each species, yet the viscosity at maximal adhesion for each species is nearly identical,  $10^5$ - $10^6$  cP. Many natural systems take advantage of viscosity to improve functional response, but spider glue's humidity responsiveness is a novel adaptation that makes the glue stickiest in each species' preferred habitat. This tuning is achieved by hygroscopic organic salts that determine water uptake in the glue. We therefore anticipate that manipulation of hygroscopic salts to control viscosity will provide a simple mechanism to design humidity responsive smart adhesives.

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