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Composition and Humidity Response of the Black Widow Spider's Gumfoot Silk and its Implications on Adhesion DHARAMDEEP JAIN, CI ZHANG, LYDIA ROSE COOL, TODD.A. BLACKLEDGE, CHRYS WESDEMIOTIS, TOSHIKAZU MIYOSHI, ALI DHINOJWALA, University of Akron — Humidity plays an important part in the performance of biomaterials such as pollen, gecko toe, wheat awns, bird feathers and dragline silk. Capture silk produced by web building spiders form an interesting class of humidity responsive biological glues. The adhesive properties of the widely studied 'viscid silk' produced by orbweb-weaving spiders is highly humidity sensitive. On the other hand, relatively less is known about the dependence of composition and humidity response towards adhesion for 'gumfoot' silk produced by cobweb-weaving spiders. In the present study, we investigate the gumfoot silk produced by Black Widow using adhesion mechanics, microscopy and spectroscopic methods. The results show the presence of hygroscopic salts, glycoproteins and previously known spider coating peptides in silk and their importance in the humidity response and adhesion. The current study elucidates the role of constituents of capture silk in its adhesion mechanism and offers insights to novel ways for fabricating bio-inspired adhesives.

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