Effect of capillary bridge on interfacial adhesion of wearable electronics to epidermis

Qitao Wang[a,b,c], Weitong Chen[a,b,c], Jian Wu[a,b,c †]

[a]AML, Department of Engineering Mechanics, Tsinghua University, Beijing 100084, China

[b]Center for Flexible Electronics Technology, Tsinghua University, Beijing 100084, China

[c]Center for Mechanics and Materials, Tsinghua University, Beijing 100084, China

Abstract

Epidermal electronics, which is the next generation wearable electronics for the healthcare applications, provides the robust, noninvasive and long-lived interfaces with human body. The secretions of the body have significant effects on the adhesion of the wearable electronics to epidermis for the long-time wearing, where the different shapes of the capillary bridges form on the circular and thin rectangular sensors. The capillary bridge and fracture models are developed to study the profile evolution and capillary force of the sweat between the wearable electronics and skin. The sensor sizes of the wearable electronics have significant effects on the opening behaviors of the interface cracks due to the growth of the capillary bridge of sweat. There are different influences of the mechanical properties of the substrates on the penny and slender cracks. This study provides a useful framework to investigate the underlying mechanisms of the detaching of the wearable electronics due to sweat losing from body, which is very valuable to the wearable electronics mounted on the skin for the healthcare applications.

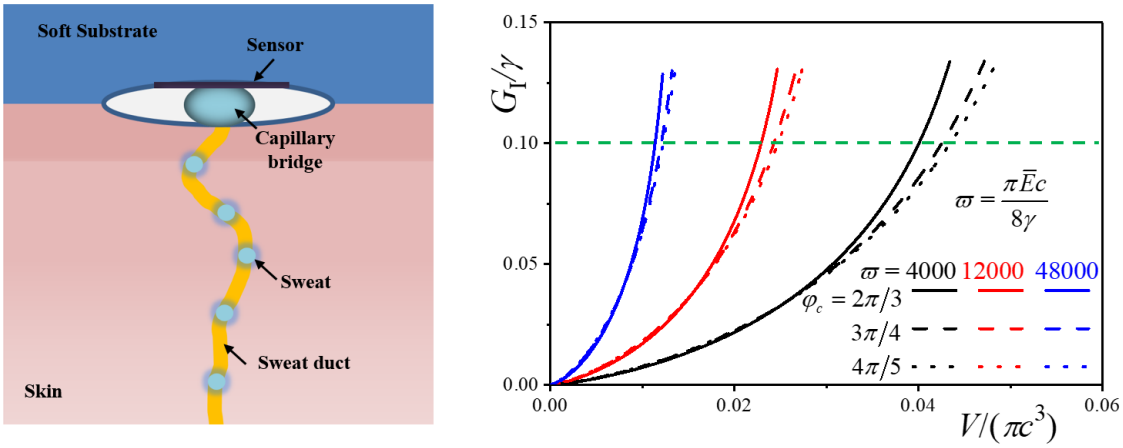

Figure 1: Interfacial debonding of wearable electronics and skin by sweat.

References

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