Abstract
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This talk explores the evolving landscape of flexible and stretchable electronics, moving beyond conventional, stiff circuits towards groundbreaking, adaptable technologies. Utilizing innovative materials such as organic semiconductors and complex support frameworks, these developments aim to boost the flexibility, visibility, and electrical efficiency of devices. A recent major commercial breakthrough has been the creation of electronics that can bend without sustaining damage, leading to the emergence of wearable gadgets, flexible solar panels, medical devices that meld with the human body, and, particularly, adaptable displays. Although bendable electronics have hit the market, the leap to stretchable solutions faces significant hurdles.

The talk focuses on refining the building blocks of organic light-emitting diodes (OLEDs) to achieve high performance cost-effectively for widespread production. A novel approach makes device more stretchable by introducing tiny wave-like patterns in the surface, reducing stress on the thin layers atop when stretched, thus decreasing the likelihood of breakage.

The investigation covers the fabrication and testing of the individual thin films that make up an OLED, employing advanced tools like atomic-level microscopes, and custom systems for assessing material behaviour under various optical, electrical, and mechanical conditions, underpinned by computer modelling.

Successfully fabricating operational OLEDs on these elastic, patterned surfaces mark a milestone, demonstrating encouraging results albeit with slightly reduced light emission efficiency compared to their rigid counterparts. Experiments show that indium tin oxide films adapted to this wavy design can stretch three times more than their flat counterparts. Though these findings are optimistic, further testing is essential to assess the performance of these OLEDs when stretched in real-world applications.

To conclude, this presentation highlights the progress and persistent obstacles in crafting fully operational, stretchable OLED displays, emphasizing the need for a detailed analysis of all aspects of these devices to drive further research and breakthroughs in the field of stretchable electronics.