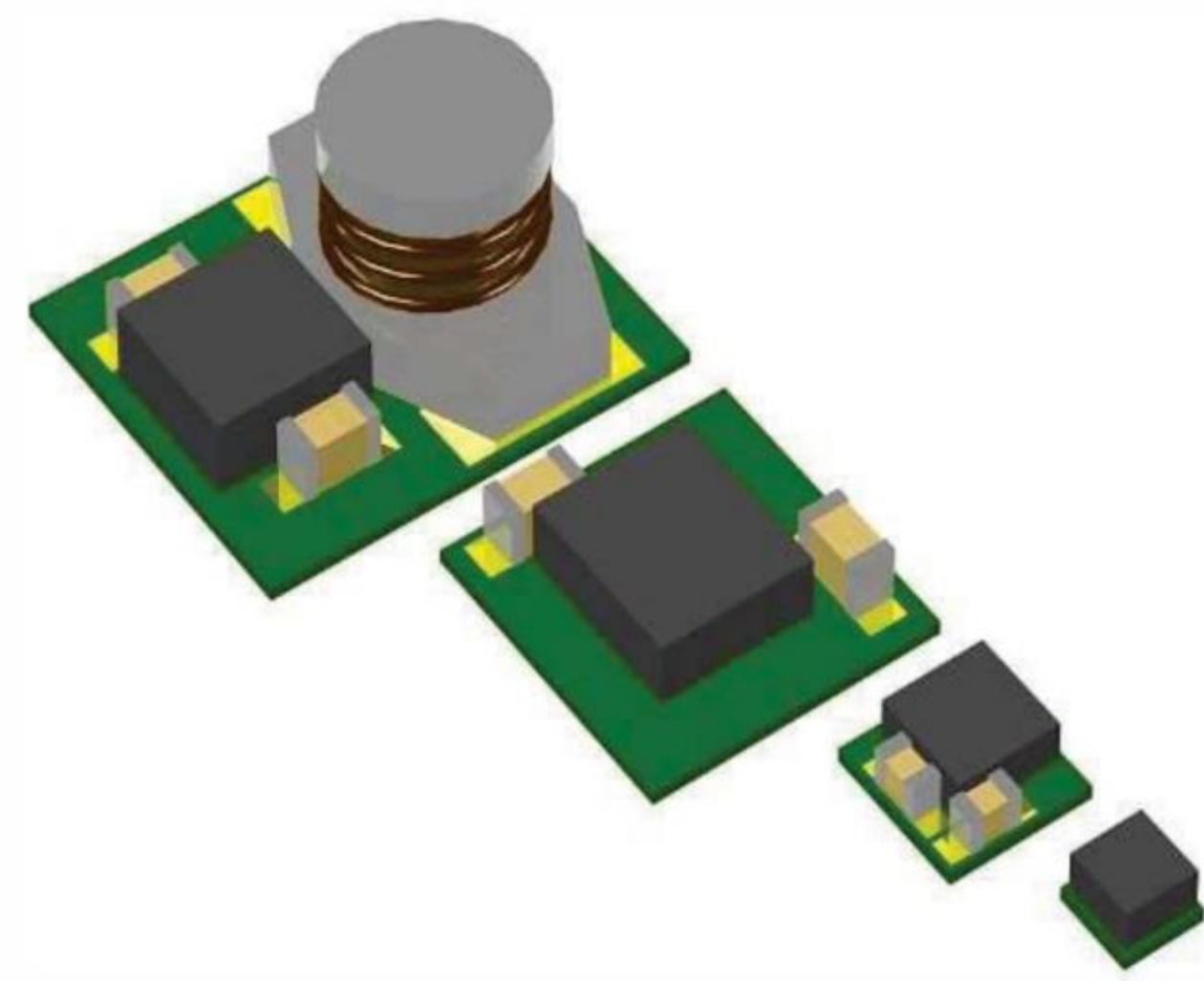


## Introduction



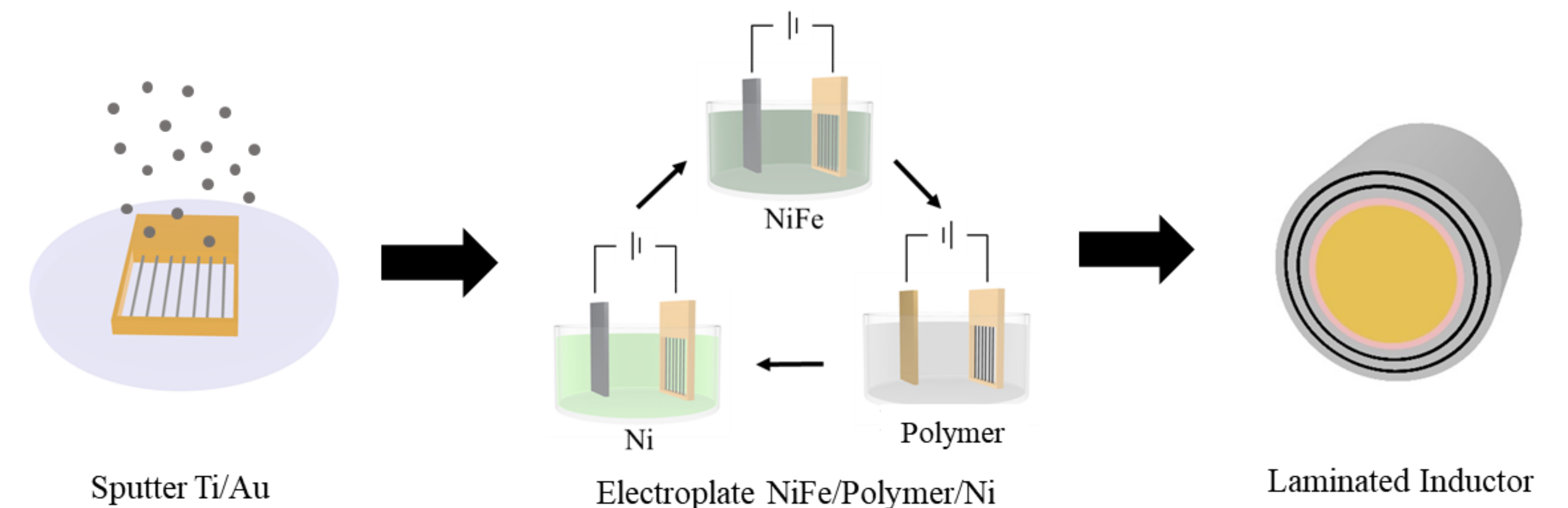
(ref) Cian O'Mathuna, PwrSiP power supply in package power system in package, 2016 International Symposium on 3D-PEIM

-Power system-in-package (PwrSiP) enables economical, compact, and modular solutions for power conversion in electronic systems.

-To realize the PwrSiP concept, all key components need to be scaled down, especially inductors. However, winding micron-scale thick inductors is challenging.

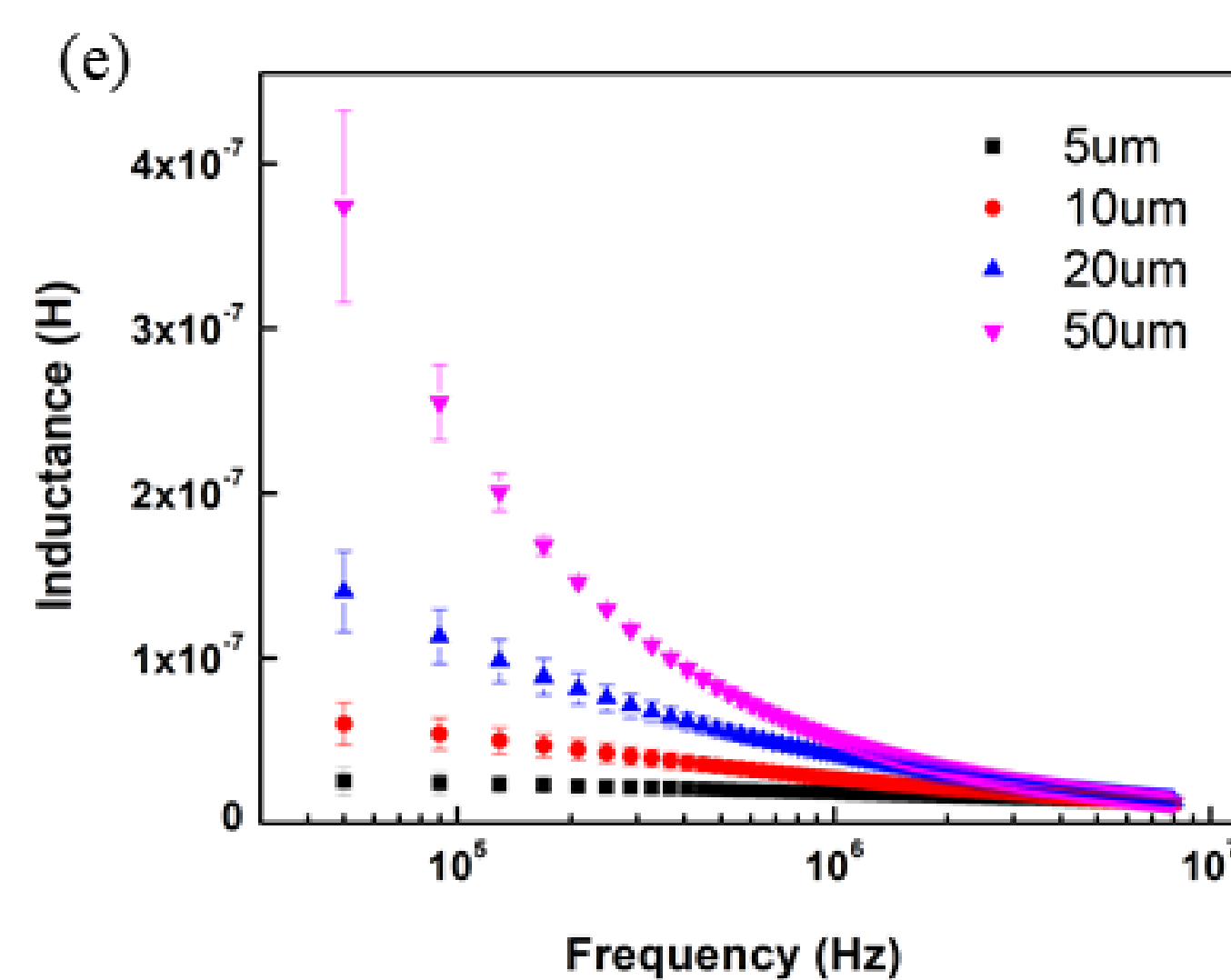
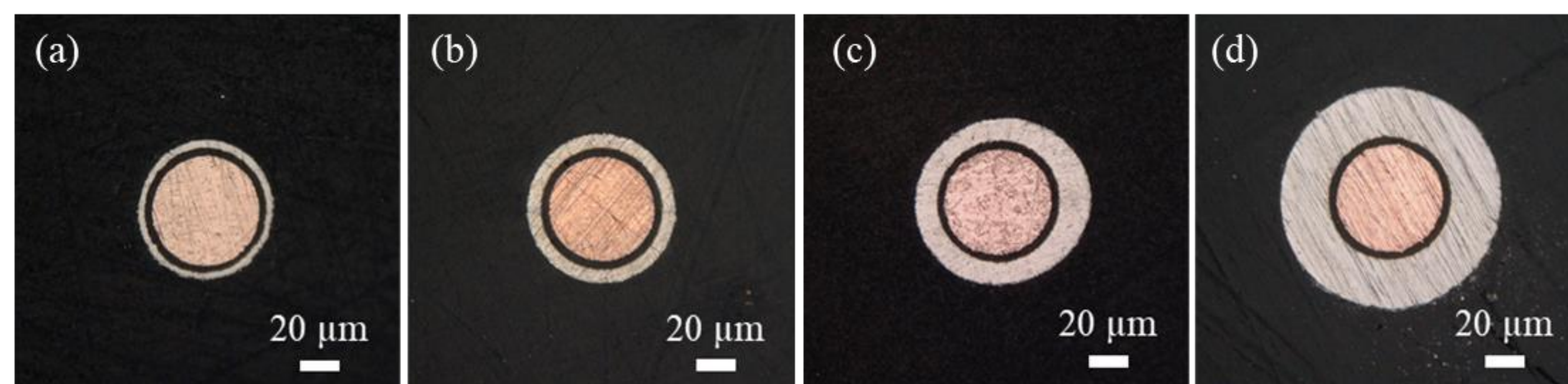
-We propose a strategy of making a one-turn-like wire inductor, while simultaneously maintaining the ability to electrodeposit laminations and interlamination insulation.

## Fabrication Process

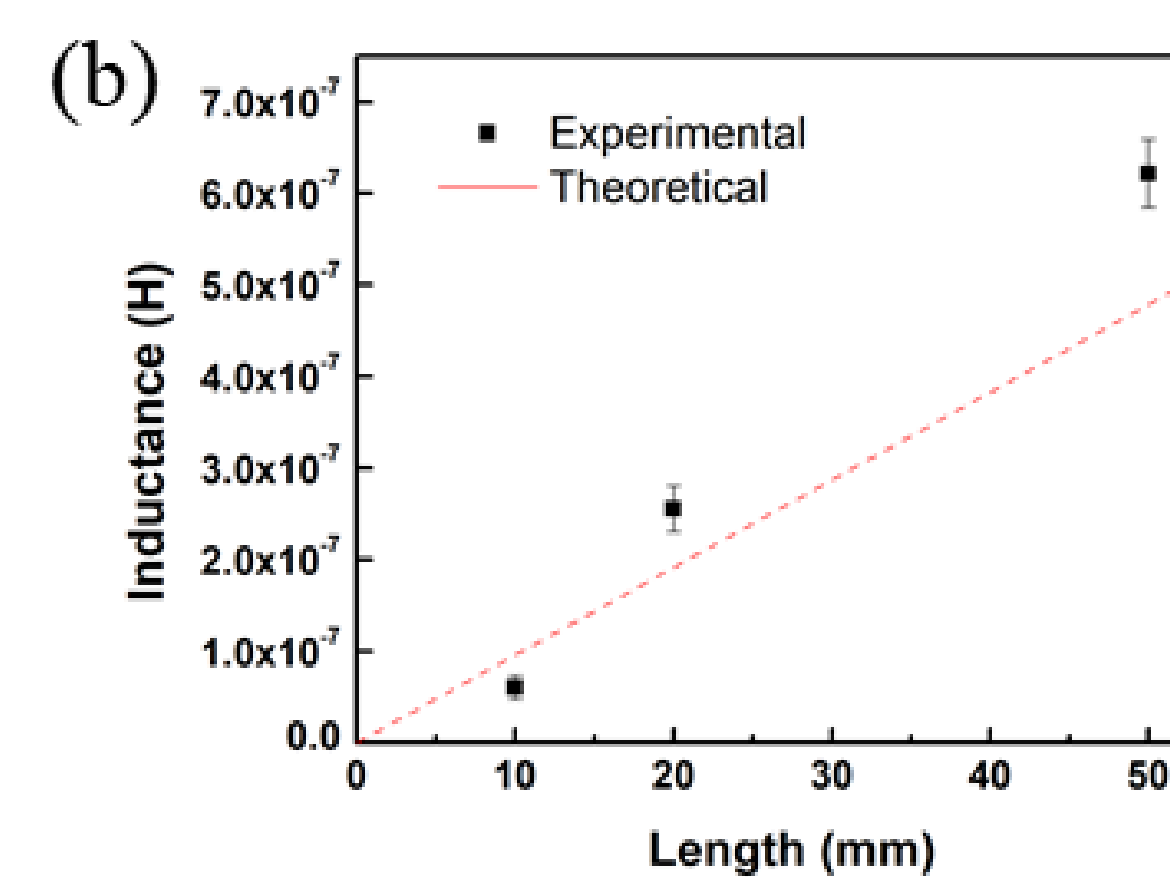
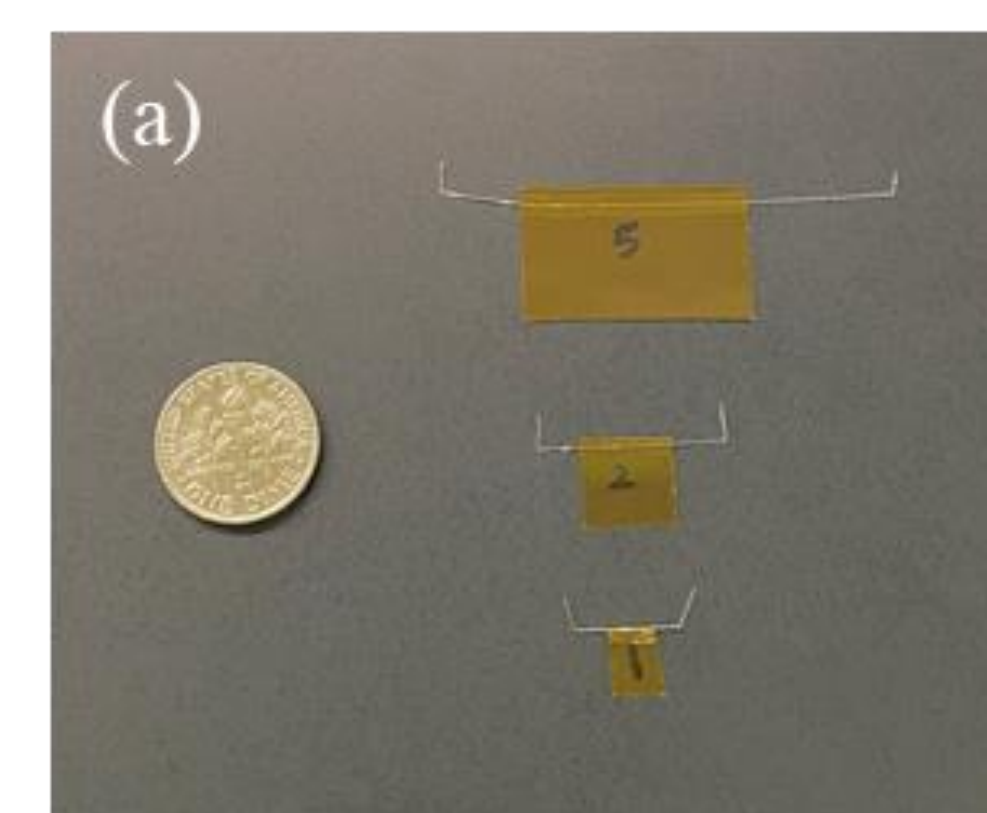
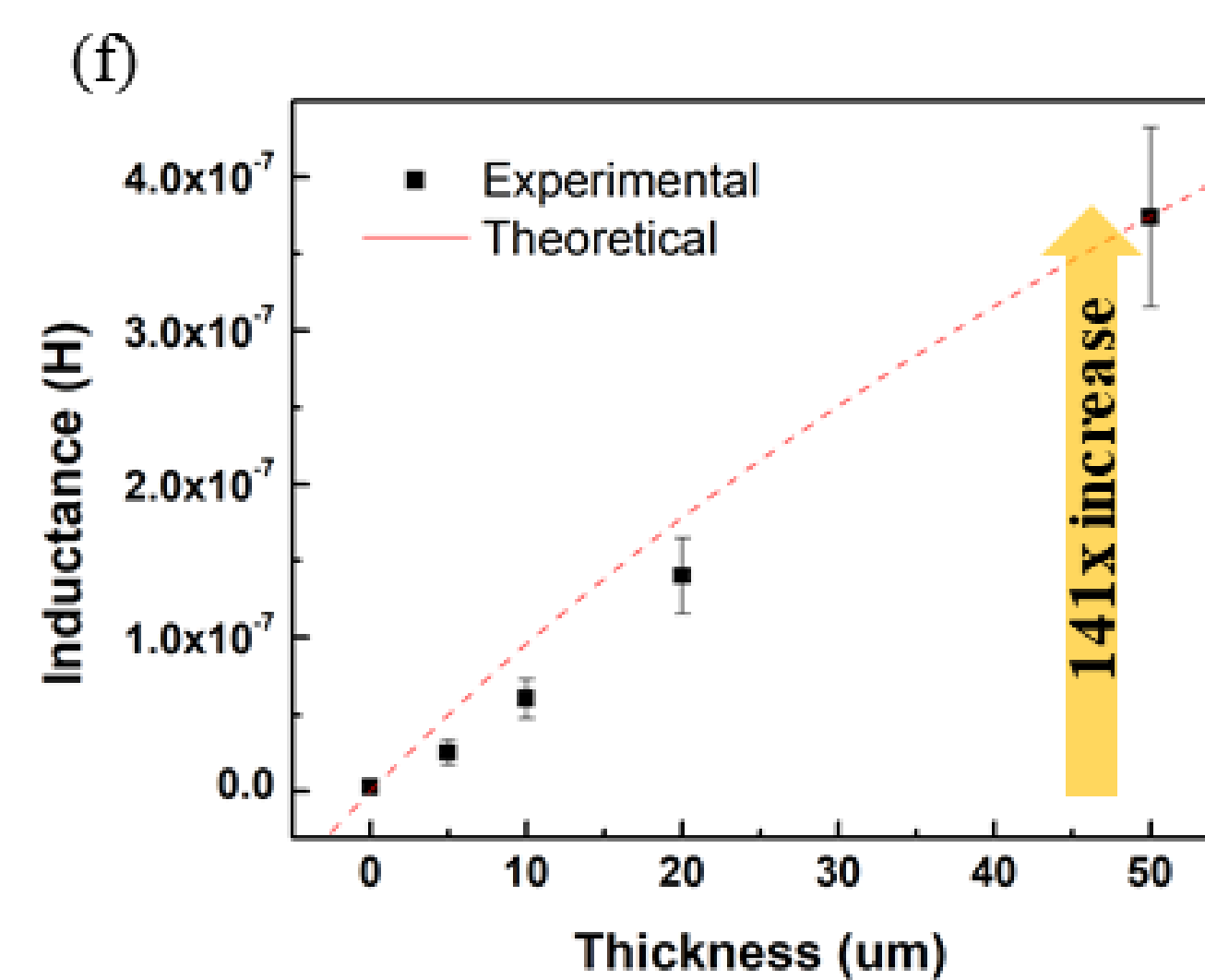


-We fabricated cylindrical wire inductors by winding enamel-insulated copper wires on a frame, sputtering seed layer, and electroplating magnetic core materials.

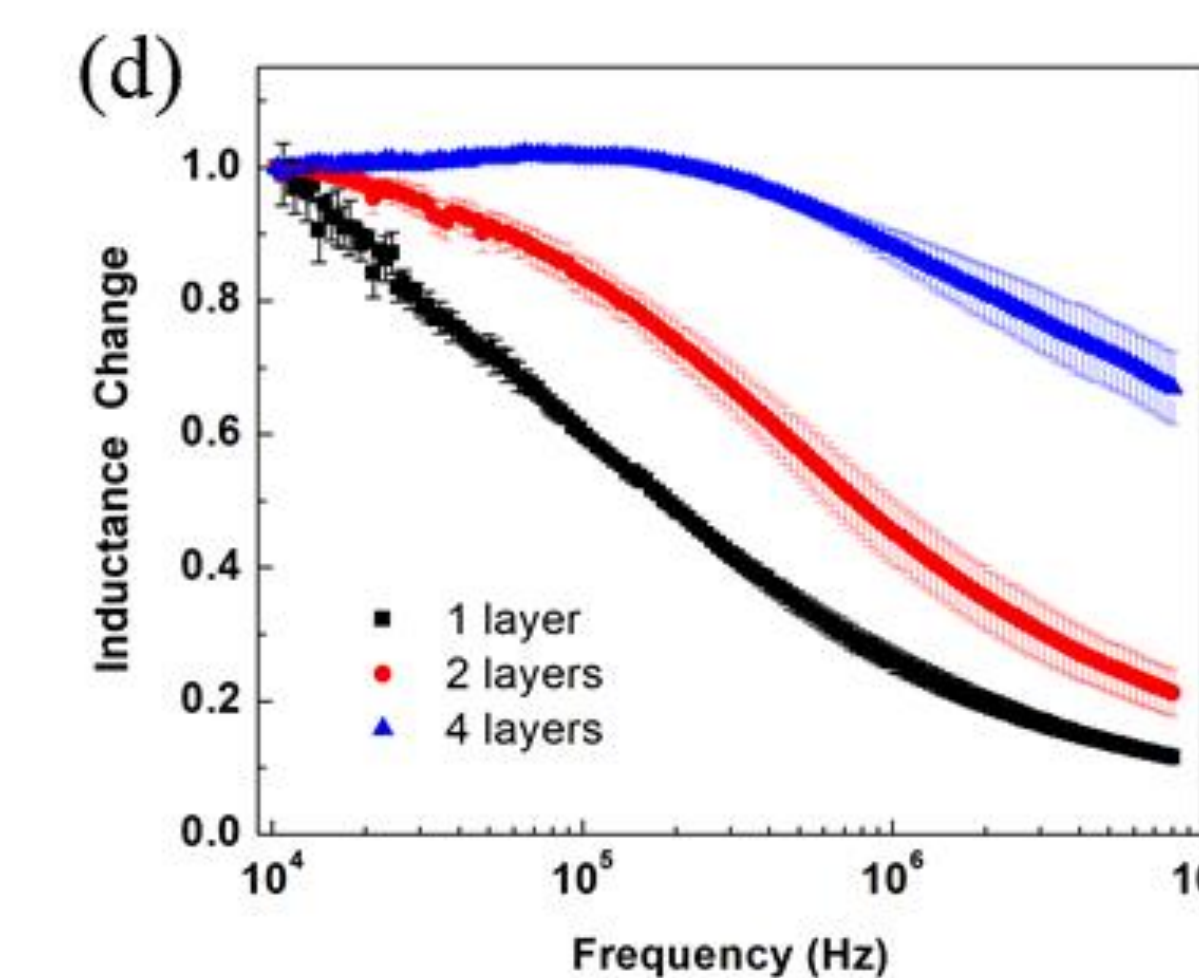
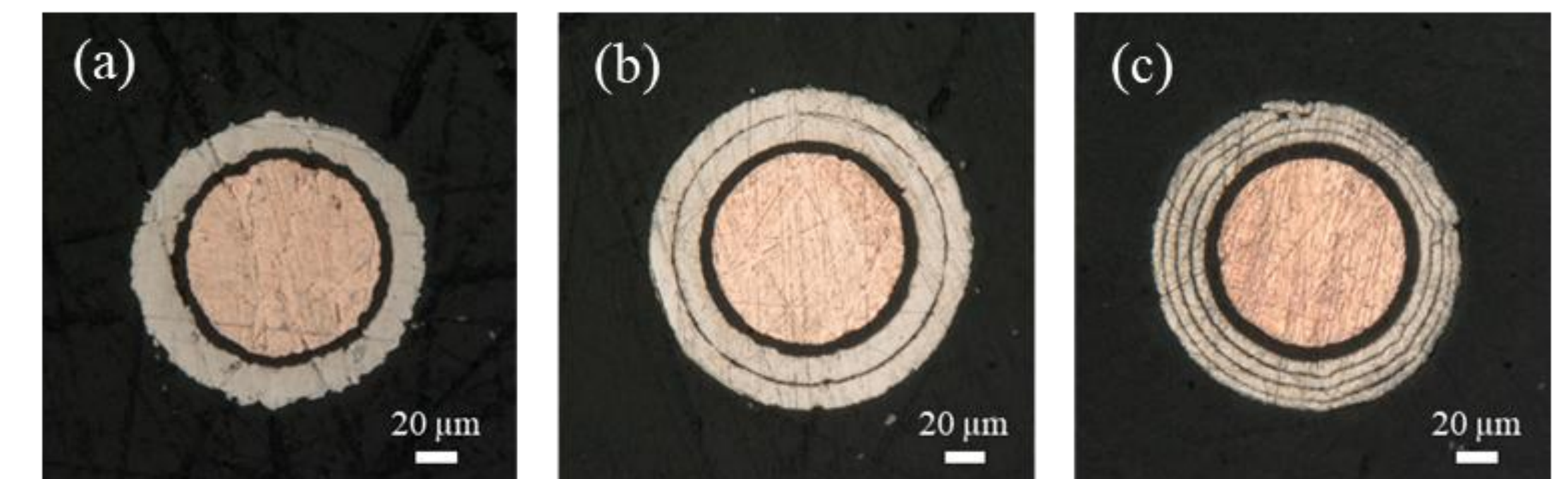
## Experimental Results



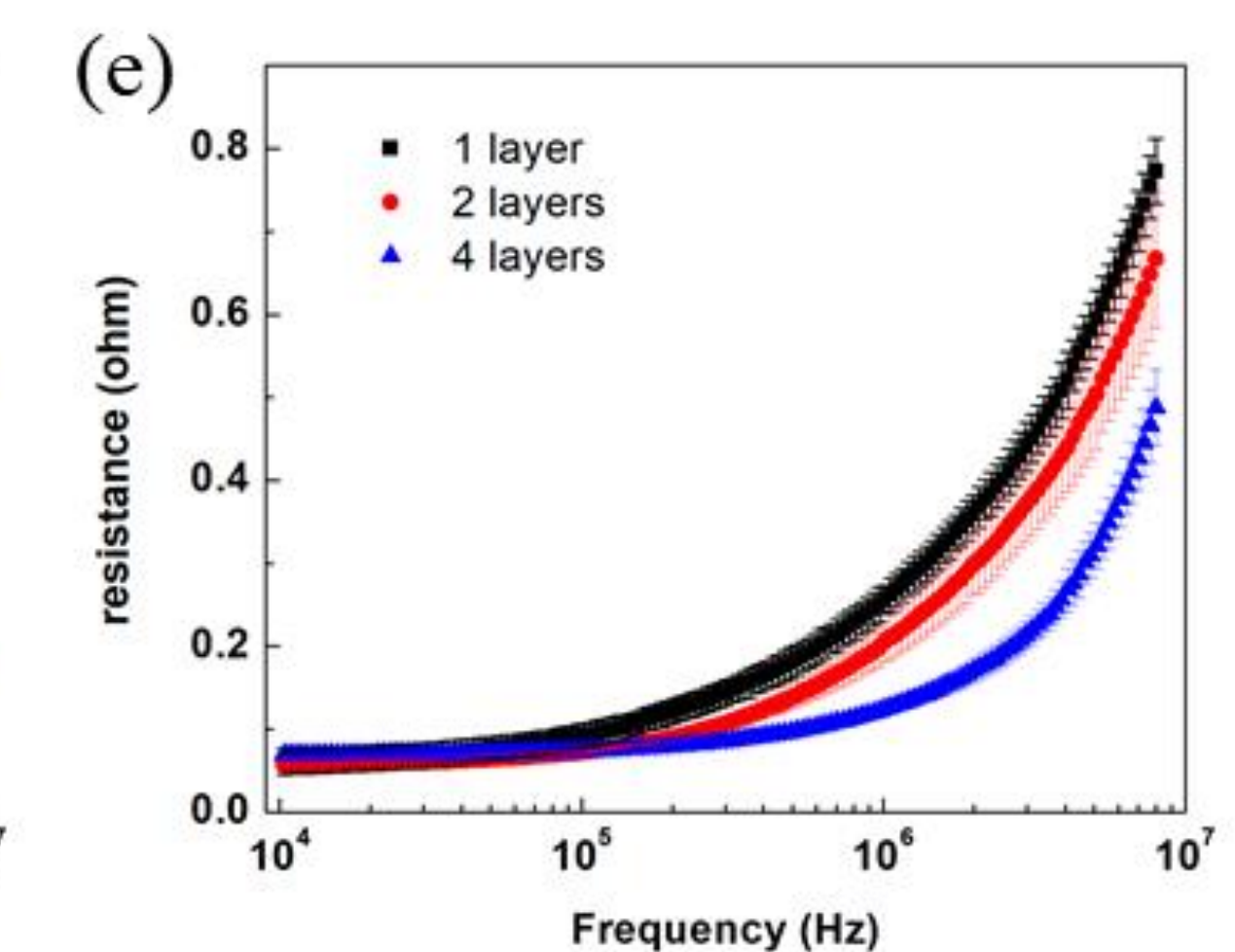
-Compared to 5 μm thick NiFe, 50 μm NiFe wire inductor presents ~15 times higher inductance, showing a wide window of inductance values controllable by core thickness



-Controlling wire inductor lengths also manipulates wire inductance.



-Multilayer inductors possessed more stable frequency behavior, indicating the suppression of eddy currents by the laminations



## Conclusion

We have fabricated a single turn winding micro-inductor having lamination of metallic magnetic core, NiFe, and interlamination insulation layer, conductive polymer. Tunability of inductance was demonstrated by changing the lengths and core thicknesses. Suppression of eddy-current through lamination was also shown. We believe our work proposed an effective strategy to overcome the challenges of winding on inherently fragile micro-inductor cores for high frequency operations.

## Acknowledgment

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