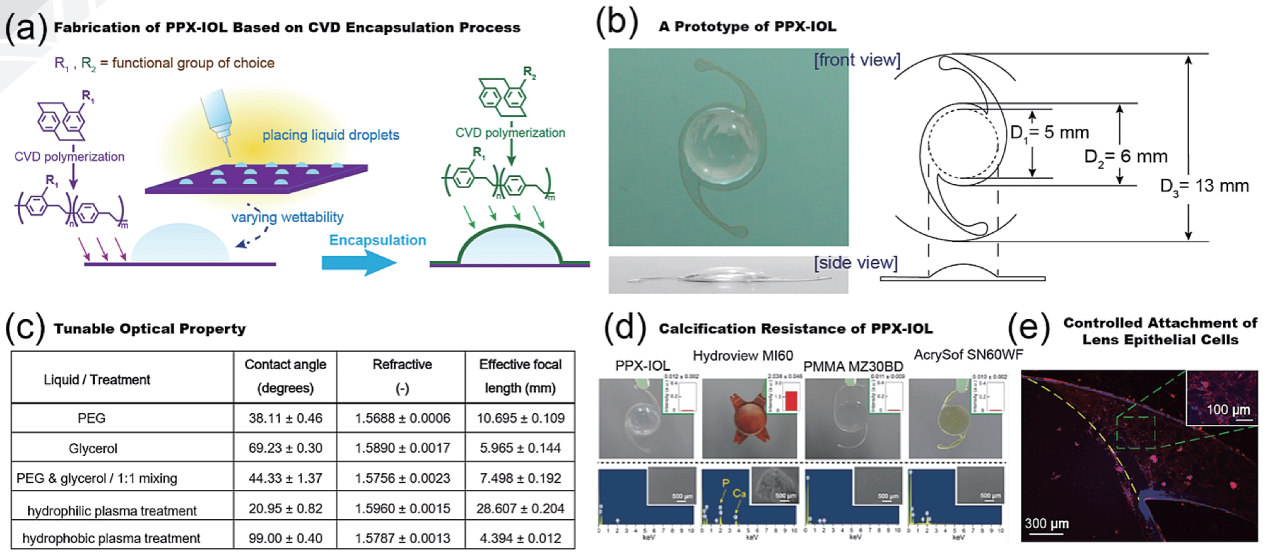

Liquid / Treatment	Contact angle (degrees)	Refractive (-)	Effective focal length (mm)
PEG	38.11 ± 0.46	1.5688 ± 0.0006	10.695 ± 0.109
Glycerol	69.23 ± 0.30	1.5890 ± 0.0017	5.965 ± 0.144
PEG & glycerol / 1:1 mixing	44.33 ± 1.37	1.5756 ± 0.0023	7.498 ± 0.192
hydrophilic plasma treatment	20.95 ± 0.82	1.5960 ± 0.0015	28.607 ± 0.204
hydrophobic plasma treatment	99.00 ± 0.40	1.5787 ± 0.0013	4.394 ± 0.012

(a)-(b): Fabrication process and the prototype of the PPX-IOL; (b)-(e): The customizable optical and biofunctional properties of PPX-IOL.

complica-tions.

Currently, an increasing number of people suffer from cataract disease, and ap-proximately 10 million IOLs are implanted worldwide each year. There is high demand for the development of new IOL devices with properties to fulfill different optical and bio-logical requirements of each patient. The design parame-ters for the PPX-IOL device are flexible, modifications are simple, and most important of all, the optical and biological properties are customizable to a specific patient's needs. This PPX-IOL device may pave the way to the next generation of biomedical optics products.

Reference

Jyun-Ting Wu, Chih-Yu Wu, Shih-Kang Fan, Chih-Chen Hsieh, Yu-Chih Hou, and Hsien-Yeh Chen. (2015). Customizable Optical and Biofunctional Properties of a Medical Lens Based on Chemical Vapor Deposition Encapsulation of Liquids. *Chemistry of Materials*, 27, 7028-7033. DOI: 10.1021/acs.chemmater.5b02433

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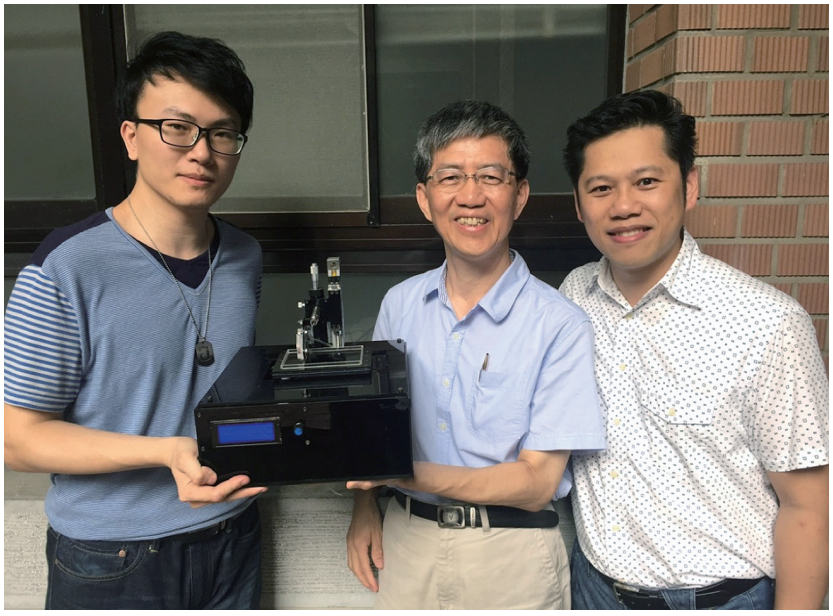
A novel western blotting device using thin-film direct coating with suction (TDCS) originally invented at NTU

Western blotting (WB) is widely used in life science studies and clinical diagnoses to detect target proteins in tested samples, such as cells or tissues, via specific antibody–antigen interactions. However, reducing both of the high material consumption costs, such as expensive antibodies, and long operation times, is still necessary to break through the WB efficiency bottleneck, especially in mass detection processes.

Intuitively, these two expectations present a dilemma because further reducing the antibody consumption would prolong the operation time and increasing the antibody concentration could decrease the operation time but increase the material costs based on the standard WB protocol. It is important to note an issue that arises in the standard protocol due to the widespread use of highly diluted solutions of primary antibodies (generally between 0.5 and 5 μg/mL to reduce material costs): millions of solvent molecules are homogeneously distributed around each solute (antibody) in the dilution process. As a result, a much longer path is formed, preventing the antibodies from contacting and binding to the antigens on the membrane. Moreover, the thicker the solution in the incubation container is, the lower the average contact probability of the antibody on the membrane becomes. This hinders the chemical reaction process and thus requires a much longer incubation time. Theoretically, gentle agitation, for example by an orbital shaker, could help to enhance the contact probability during the chemical reaction, but this would also increase the amount of antibody waste adhered on the walls of the incubation container.

Based on this analysis, keeping the membrane area constant and reducing the depth of the probing solution not only shortens the average contact distance of the antibodies to the antigens on the membrane (to enhance the chemical reaction, thus shortening the operation time) but also reduces the material consumption costs (due to the lower solution requirements). A miniaturized coater[1] for thin-film direct coating (TDC) has been developed. The μm-thin film of highly diluted antibody solution (0.04 μg/mL) was then directly and uniformly coated on the tested membrane. This novel TDC technique invented at NTU could markedly reduce the amount of antibody required for WB with an even better signal[2]. Furthermore, by using the advanced technique of TDC with suction (TDCS) to further enhance the performance, the signal-to-noise ratio of immunoblotting can be further increased, and the amount of antibody consumption can even be reduced by a factor of 100 in comparison with conventional WB. Theoretically, the corresponding operation time can be reduced from 3 hours in conventional WB to approximately 5 minutes or even less using TDCS[3]. This novel device can be applied to the high-throughput screening of antibody-drug targets, functional assays, and cell-based binding assays, as well as technology transfer for industrial commercialization.



TDCS prototype and some of the authors of the recent paper[3] (From left to right: C.-Y. Liu, A.-B. Wang and S.-C. Chang)

Reference

1. An-Bang Wang, Yu-Wen Hsieh, Yu-Ju Liu, Coating Module, TW Patent I 496625, JP Patent 5837003, 2015.
2. Yi-Kuang Yen, Yi-Wei Jiang, Shih-Chung Chang, and An-Bang Wang. (2014). Western blotting by thin-film direct coating, *Analytical Chemistry*, 86 (10), 5164-5170. DOI: 10.1021/ac5010162
3. Chao-Yuan Liu, De-Chao Lu, Yi-Wei Jiang, Yi-Kuang Yen, Shih-Chung Chang and An-Bang Wang. (2016). Easy and Fast Western Blotting by Thin-Film Direct Coating with Suction, *Analytical Chemistry*, 88 (12), 6349-6356. DOI: 10.1021/acs.analchem.6b00699

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