Capacitive displays as direct signal transducers for potentiometric measurements

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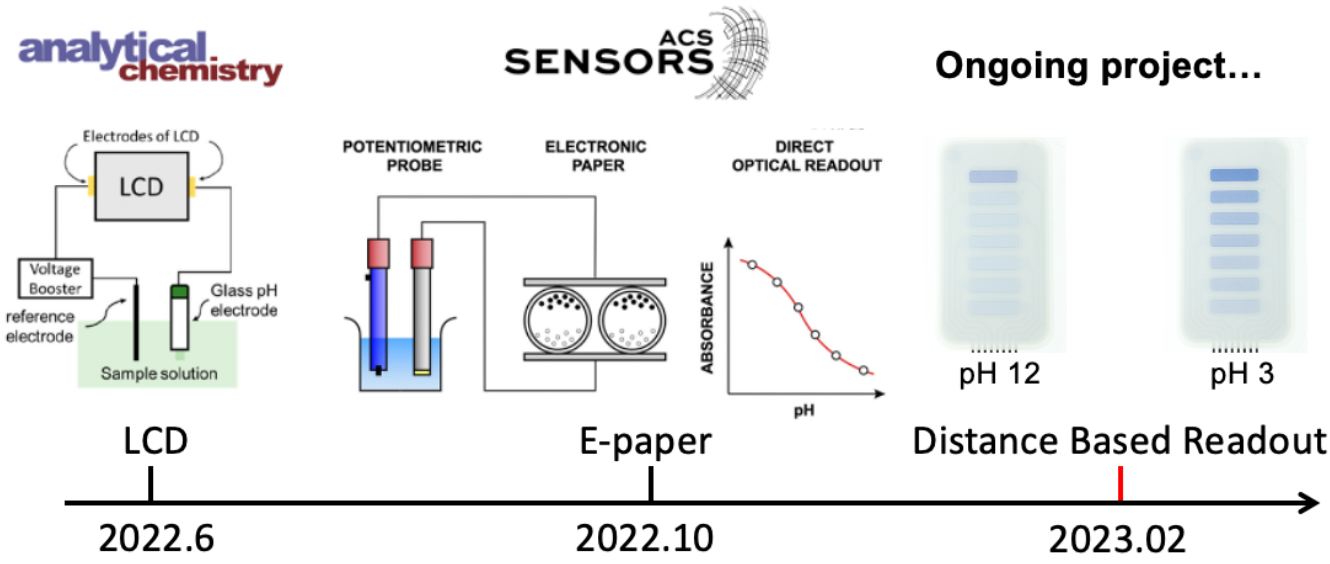
Fully self-powered chemical sensors are very attractive because they should be environmentally friendly and have the potential for miniaturization. Among all self-powered sensors, chemical sensors based on electrical-optical conversion seem attractive because of their precision and compatibility with wearable devices.

Our group reported on capacitive display elements, including liquid crystal displays and e-paper, as transducers to convert the potential signal to a readable color change for the first time. Capacitive displays may precisely tune their absorbance to the applied voltage, if possible with an uncertainty on the order of 0.5 mV.[1,2] Unlike traditional electrochromic materials that slowly change their color through chemical processes on a time scale of minutes, such display elements respond to the applied voltage physically, such as reorienting the liquid crystal in the pixel and migrating charged pigments in an electrical field.[3] This allows one to observe a much faster signal transaction with a few seconds and in a wide voltage range of about 1 V.

This contribution will demonstrate three self-powered sensors using capacitive displays to convert the potential signal directly to an optical readout, including the ability to achieve a direct distance-based readout without the need for a traditional power supply.



[1] Wu, Y. and E. Bakker, *ACS Sens.*, **2022**, *7(10)*, 3201-3207.
[2] Wu, Y. and E. Bakker, *Anal. Chem.*, **2022**, *94(29)*, 10408-10414.
[3] Jansod, S. and E. Bakker, *Anal. Chem.*, **2021**, *93(9)*, 4263-4269.