

# Flexible Multifunctional Sensor based on Poly (Vinylidene Fluoride) Thin Film

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## Research Topics

- Fabrication and design for the poly(vinylidene fluoride) (PVDF) film
- Application of PVDF film to hydrogen gas sensors and pressure sensors

## Research Seeds

### Fabrication and design of PVDF film

The conventional PVDF-based sensor fabrication process is complicated and time-consuming. We have developed a simple method of synthesizing  $\beta$ -phase PVDF film that is useful for flexible multifunctional sensors such as hydrogen gas sensors and pressure sensors<sup>(1)</sup>. The PVDF film synthesized using the wet process has a porous structure consisting of PVDF microscaled grains. This porous structure provided a better distortion property, which is suitable for our proposed sensors. Our sensors provide the important benefit of operation at room temperature without a power source<sup>(2)</sup>.

### Application of PVDF film to hydrogen gas sensor and pressure sensor

Fig. 1 shows output voltage versus time curves of a sensor exposed to different concentrations of hydrogen gas. It is evident that the output voltage increased with increasing hydrogen concentration<sup>(3)</sup>. The output voltage, which is determined by the volume expansion of the Pd film deposited on PVDF film, accordingly depends on the hydrogen concentration.

Fig. 2 presents the output voltage curves collected using a tapping pressure sensor when tapping on the sensor with a finger. Our PVDF film can be applied to other types of sensors such as tactile sensor and sphygmomanometer because the PVDF film can be formed rather easily on flexible polymer films.

(1) Pat. 6048870. (2) Y. Imai *et al.*, Appl. Phys. Lett. **101**, 181907 (2012).

(3) Y. Imai *et al.*, Sens. Actuators B, **247**, 479-489 (2017).

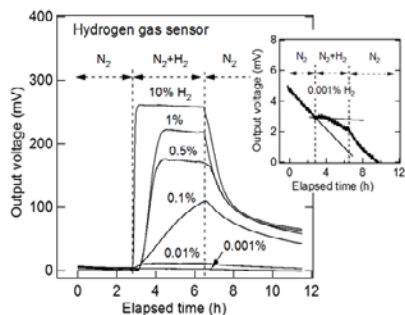


Fig. 1 Response curves of Pd-coated PVDF hydrogen gas.

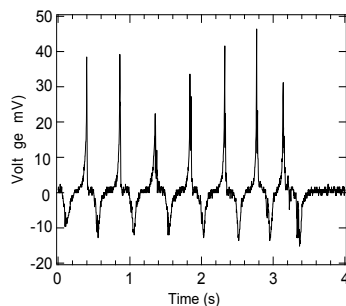


Fig. 2 Response curves of the PVDF pressure sensor for tapping stimulus.

## Related Technology

- Fabrication of organic piezoelectric film
- Measurement of sensor response characteristic