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Water-gated OFETs for Pesticide Detection

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Organic field effect transistors (OFETs) are widely utilized in alternative disposable electronic devices. These devices provide fabrication simplicity, low-cost, fast, and adequate sensitivity. A water-gated OFETs have been reported to operate under low-voltage with low-energy consumption and applied to DNA sensor. In this study, Bottom-contact top-gate water-gated OFETs were fabricated. Drain and source electrode materials were deposited by the thermal evaporation of chromium and gold respectively on glass substrate. Two configurations of electrode were used: standard and interdigitated pattern masks of which channel width and length ratios were varied and thermal evaporated for drain and source electrode. These masks were fabrication in our laboratory by contact printing. Poly(3-hexylthiophene) (P3HT) semiconducting layers were spin-coated using 1, 2 dichlorobenzene as a solvent on drain and source electrode. Deionized water droplets were applied as the dielectric layer for the devices. Gold gate electrode was dipped in deionized water on the top of device. The effects of channel width and length ratio on electrical characteristics of the semiconducting layers were investigated. It was found that the increasing channel width and length ratio improved the electrical performance of the water-gated OFETs. However, at short-channel lengths, the OFETs no longer saturate due to space charge limiting current effect. Changes in transistor characteristics when diluted pesticides were added to the water dielectrics were discussed.

Primary author: Mr INPOR, Kroekchai (National Metal and Materials Technology Center (MTEC), Thailand Science Park, Pathumthani, THAILAND 12120)

Co-authors: Mrs THANACHAYANONT, Chanchana (National Metal and Materials Technology Center (MTEC), Thailand Science Park, Pathumthani, THAILAND 12120); Ms LUKKANAKUL, Nawarin (Department of Biomedical Engineering, Faculty of Engineering, Mahidol University); Mr KERATIPAIBOON, Nuttakorn (National Metal and Materials Technology Center (MTEC), Thailand Science Park, Pathumthani, THAILAND 12120); Mrs SRITONGKHAM, Pornpimol (Department of Biomedical Engineering, Faculty of Engineering, Mahidol University); Ms PRICHANONT, Seeroong (Department of Chemical Engineering, Chulalongkorn University, Bangkok, THAILAND 10330); Mr PRATONTEP, Sirapat (College of Nanotechnology, King Mongut's Institute of Technology Ladkrabang); Mr SATTIYA, Vasin (Department of Biomedical Engineering, Faculty of Engineering, Mahidol University)

Presenter: Mr INPOR, Kroekchai (National Metal and Materials Technology Center (MTEC), Thailand Science Park, Pathumthani, THAILAND 12120)

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