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Short communication

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# Eco-friendly cross-linked polymeric dielectric material based on natural tannic acid

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## Abstract

Until now, development of conventional electronic devices has mainly focused on performance, and e-waste disposal has been neglected. To alleviate e-waste disposal problems, the use of naturally degradable materials as electronic components has been studied. While most research on such materials has focused on the substrate, other components such as dielectric insulators have not been widely studied. Here, we developed a poly-methacrylated tannic acid (PMTA) naturally degradable dielectric material with good electrical breakdown strength ( $5.4 \text{ MV cm}^{-1}$ ), good long-term stability in ambient, and a stable surface. Pentacene thin-film transistors (TFTs) with a PMTA dielectric insulator layer showed reasonable field effect mobility of  $0.2 \text{ cm}^2 \text{ V}^{-1} \text{ s}^{-1}$  at  $-20 \text{ V}$  of gate voltage ( $V_g$ ). In addition, the pentacene TFTs with a PMTA dielectric insulator layer and a polyvinyl alcohol substrate show a good degradability in natural; the TFTs were fully decomposed within 8 days in phosphate buffered saline (PBS buffer solution). Also, the TFTs with a PMTA dielectric insulator layer were fully decomposed within 19 days in 3.5 wt% sodium chloride solution, similar to seawater, which has a good potential for reduction of e-waste.

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