# Novel Vapor-phase Synthesis of Homogeneous Organic-Inorganic Hybrid films and its Application to electronic devices

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Organic-inorganic hybrid dielectrics have attracted considerable attention for improving both the dielectric constant (k) and the mechanical flexibility of the gate dielectric layer for emerging flexible and wearable electronics. This study proposes a novel vapor-phase synthesis method to form an ultra-thin, homogeneous, high-k organic-inorganic hybrid dielectric. A series of hybrid dielectrics is synthesized via initiated chemical vapor deposition (iCVD) in a one-step manner. The thickness and composition are effectivley controlled to form a uniform, defect-free hybrid dielecric. As a result, the synthesized hybrid dielectric has a high-k value of as high as 7 and exhibits a low leakage current density of less than $3 \times 10^{-7}$ A/cm at 2 MV/cm. Furthermore, the dielectric layer shows exceptional chemical stabiliy without any degradation in its dielectric performance and a smooth surface morphology. Organic thin film transistors with the developed hybrid dielectric as the gate dielectric achieved hysteresis-free transfer characteristics with an operating voltage of up to 4 V and excellent mechanical flexibility as well.