Utrathin polymeric thin films for the application to organic electronics

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Insulating layer is an essential component enabling reliable operation of FETs, flash memory, and capacitors – key building blocks in modern electronic systems. New generation of electronic devices often requires insulating layers to work with unconventional substrates and newly emerging semiconductor materials such as organic semiconductors, graphenes, carbon nanotubes, and oxide semiconductors. Here, we demonstrate a vapor-phase deposited ultrathin polymer film prepared via one-step, solvent-free technique called iCVD as a versatile polymeric insulating layer that meets a wide range of requirements for next-generation electronic devices. The iCVD process enables the formation of highly uniform and pure ultrathin films in the order of 10 nm with excellent insulating properties, hallmarked by its large energy gap(> 8 eV), tunneling-limited leakage characteristics, amorphous nature, and resistance to a tensile strain of up to 4%. The iCVD process and the insulating layers made thereby can play a critical role in realizing future soft electronic devices, which are non-destructive and have suitable electrical and mechanical characteristics.