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Eliminating gate bias stress effects in organic field-effect transistors WOLFGANG L. KALB, THOMAS MATHIS, SIMON HAAS, ARNO F. STASSEN, BERTRAM BATLOGG, Laboratory for Solid State Physics, ETH Zurich, Switzerland — We report on organic field-effect transistors with unprecedented resistance against gate bias stress. The single crystal and thin-film transistors combine small molecule organic semiconductors and an organic gate dielectric with a remarkable electrical breakdown strength. The single crystal devices have no current hysteresis. Extended gate bias stress leads to almost unmeasurable changes in the transfer characteristics: the induced interface state density is of order $10^9/\text{cm}^2$. In contrast, stress-induced trap densities of order $10^{12}/\text{cm}^2$ have been identified previously in devices with SiO_2 or OTS-treated SiO_2 gate dielectrics. Therefore, adverse gate bias stress effects are not generic to oligocene organic semiconductors, and there is no conceptual limitation for the stability of organic-based transistors in contrast to hydrogenated amorphous silicon.

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