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Effect of using split-gate electrodes on a pentacene based field effect transistor NICHOLAS PINTO, University of Puerto Rico-Humacao, CARL MUELLER, Analex Corporation, Cleveland, NOULIE THEOFYLAKTOS, NASA-Glenn Research Center, Cleveland, ALAN JOHNSON, University of Pennsylvania, FELIX MIRANDA, NASA-Glenn Research Center, Cleveland — We present our results of using split-gate electrodes on an evaporated film of pentacene in a field effect transistor configuration. Pentacene was purchased from Aldrich and used as received. Two split-gate electrodes, each 20 μm wide and separated by 4 μm were patterned on a Si/SiO_2 substrate over which an additional 100 nm of SiO_2 was grown. Source (S) and drain (D) electrodes were evaporated onto the substrate, centered on the buried split-gate structure. Finally, a pentacene film of thickness 500 nm was evaporated onto the patterned substrate in vacuum ($2x10^{-5}$ mbar). Current voltage characteristics of this device show negligible S/D drain current under S/D biases up to -10V with either or both gates turned "off" (gate electrodes grounded) but does show an increase of about two orders of magnitude in the S/D current (at a S/D bias of -10V) when both gates are turned "on" with a voltage of -12 V. Several devices were tested and gave similar results. Based on these results the device can be treated as two gate controlled switches placed in series and is analogous to a logic AND gate.

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