Thin-Film Transistors: From Displays to 3D Integrated Circuits

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Thin-film Transistors (TFTs) have made enormous strides since their invention in the early 1960's and subsequent use in active matrix displays. They have been implemented with a wide range of semiconductor: from amorphous/poly silicon, organic semiconductors, amorphous inorganic oxide semiconductors, to atomically thin 2-dimensional semiconductors. The first part of the webinar will review major present and future application areas for TFTs including displays, hybrid flexible electronics, chem/biosensing, and backend-of-the-line (BEOL) circuits on silicon for 3D integration. The second part of the webinar will focus on the evolution and adaptation of TFTs for demanding BEOL applications, which require very small channel lengths and fast operation. The technical challenges in scaling channel lengths down to the 10 - 50 nm range, including contact resistance and short channel effects, and design strategies to overcome these challenges will be described. Examples of TFTs with amorphous oxide and organic/polymer active semiconductor layers will be used to illustrate various aspects of the subject.