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# Foreword

The materials science of thin films and associated fabrication process technologies continue to stimulate new technologically significant application areas related to human-machine interaction. A good case in point is the active matrix display, which relies on a layer of thin-film transistor (TFT) electronics (referred to as the display backplane) to drive the display. The backplane is crucial from the standpoint of speed, resolution, and stability, including instability compensation. An interesting material that has emerged for the backplane is the metal oxide semiconductor. The material is transparent and low-temperature processible making it amenable for layering on plastic or even paper substrates. Fully transparent displays have been demonstrated by leading companies such as LG or Samsung, which are starting to create new application areas such as smart windows for automobiles and buildings and immersive environments. These applications place new demands on the TFT, which now will have to go beyond its standard role as a simple switch to new circuit functions.

This book is an abridged version of the materials science and characterization of oxide TFTs tailored to circuit applications. Following a short introduction, the operating principles of TFTs addressing materials selection are covered in Chap. 2. Processing techniques for TFTs along with materials characterization are addressed in Chap. 3 followed by the theory, operation, and current state of the art of thin-film analog-to-digital converters (ADCs). Implementation considerations are reported in Chap. 5 with emphasis on the comparator and sigma-delta modulator ($\Sigma\Delta$M). The book concludes with future perspectives of materials and ADC architectures.

While the design concepts and circuits demonstrated here are based on metal oxide TFT technology, the design considerations can be adapted to a broader range of materials families that support p-channel transistors.

The book is well written and will benefit the engineering design community, materials scientists, physicists, and chemists who are looking for applications of new materials. The book can also serve as a useful reference for graduate or short courses in universities or industry. The authors are renown in the area of oxide TFTs.

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Arokia Nathan

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