

# Advancing information technology with materials chemistry

## At a glance

Over the last decade an unprecedented expansion of information technology has occurred in almost every area of society including business, education, healthcare and defence. This expansion has been supported through the development of the Internet and the advances made in computer hardware.

SAFC Hitech is a major supplier of precursor chemicals to the semiconductor device manufacturers who make the microelectronic integrated circuits (ICs) that are the basis of this hardware.

The significance of the collaboration with the Knowledge Centre for Materials Chemistry has been to provide fundamental insight into the precursor properties and supporting baseline information to 'qualify' these precursors for the Atomic Layer Deposition (ALD) manufacturing process, which is used in the semiconductor fabrication plants to make ICs.

## Challenge

Device manufacturers have to increase circuit density by reducing the dimensions of the transistors that are at the heart of the IC to meet the demands of continuously improved performance at lower cost. The on-going rate of device scaling is often referred to as 'Moore's law' which is illustrated below.

The advantage of ALD over alternative methods is that thin film layers are deposited layer by layer. This allows the control of film thickness and composition which is crucial as dimensions decrease and performance targets are stretched.

Shrinking transistor sizes requires the development of new materials to ensure that the transistors can continue to work effectively. The challenge for SAFC Hitech is to develop new precursors and processes that meet the stringent demands of the device manufacturers and their manufacturing processes.

## Solution

The collaboration with Liverpool University, through the KCMC was instigated to develop an ALD process for depositing thin films under the appropriate conditions of thermal budget and chemical compatibility of a complex multilayer integrated circuit.

The focus of the first phase of this project has been the development of organometallic chemicals which are attractive Atomic Layer Deposition precursors - as they allow lower deposition temperatures, and under optimum growth conditions allow the deposition of contamination-free films.

## Benefits

The production of these advanced precursors has now been commercialised by the company and SAFC Hitech is one of the largest suppliers of precursor chemicals to Semiconductor Device Manufacturers.

To meet the needs of the manufacturers, the qualification of precursors and materials is central to gaining their acceptance and integration into fabrication processes.

The company continues to work collaboratively with a large number of universities, research organisations and corporations on the development of process technologies for the advancing state of information technology.

