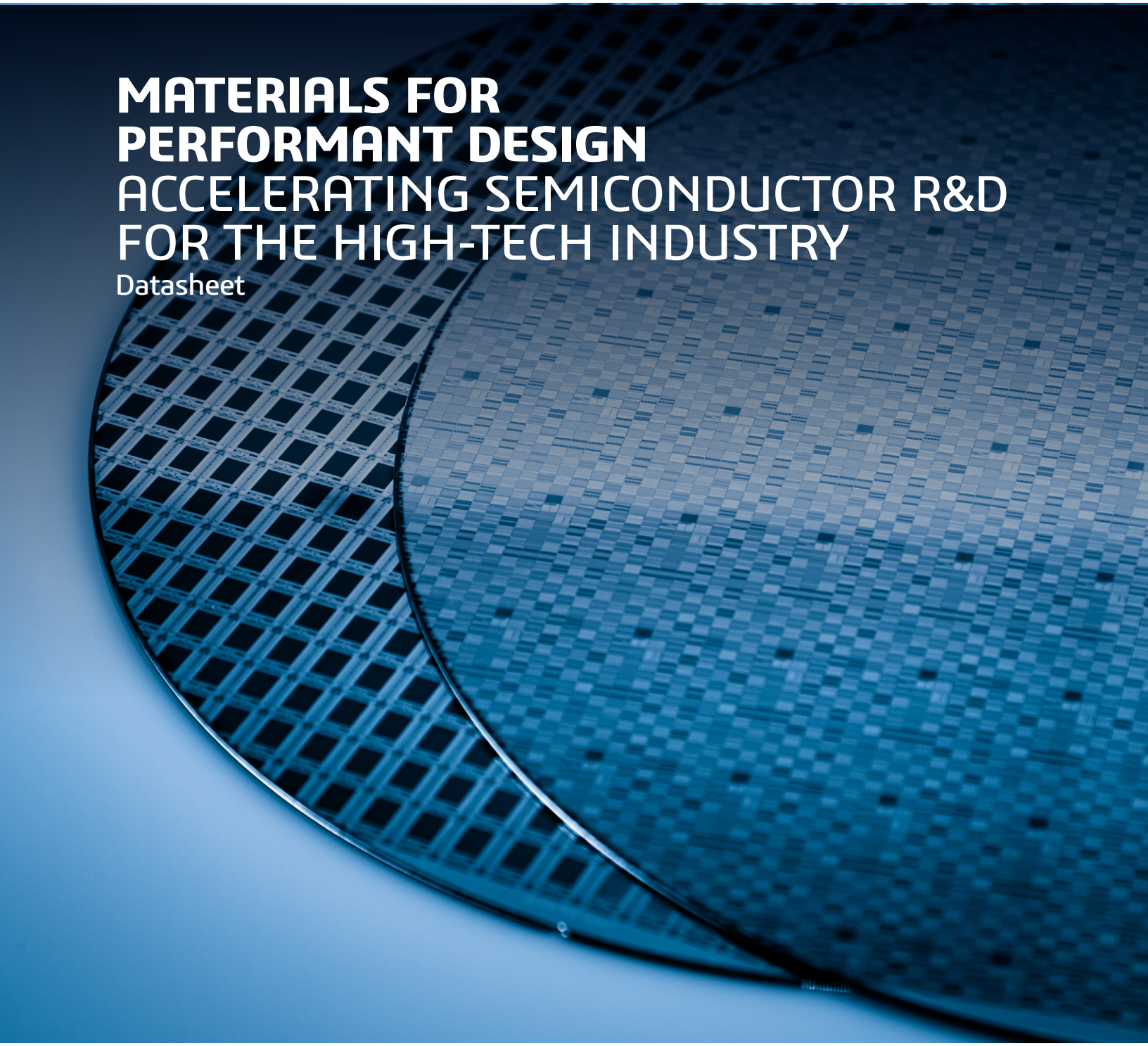
BIOVIA

3DEXPERIENCE®

MATERIALS FOR PERFORMANT DESIGN

ACCELERATING SEMICONDUCTOR R&D FOR THE HIGH-TECH INDUSTRY

Datasheet



DASSAULT SYSTEMES

Over the past century, the explosion of electronics in the High-Tech (HT) industry has fundamentally reshaped how we go about our daily lives. Transportation, communication, entertainment and more rely on – and increasingly demand – faster and more functional devices, and the growing adoption of the Internet of Things is exponentially expanding the potential use cases for semiconductors and sensors. However, this accelerating demand is creating a problem: the materials currently used for these devices are reaching their theoretical limits for size, speed, bandwidth and energy consumption. Additionally, strains on existing supply chains may influence the availability of different components at any given time, making the need for flexibility more important than ever. Pushing beyond these limits, therefore, requires a deeper understanding of the fundamental electronic and intermolecular interactions that underlie the materials properties of these devices. To keep up with current market demand, HT R&D teams will need to move beyond physical experimentation alone and increasingly embrace *in silico* techniques such as modeling and simulation.

FOSTERING UNDERSTANDING OF MATERIALS BEHAVIOR

Materials for Performant Design from Dassault Systèmes' BIOVIA brand provides a complete modeling and simulation toolset for exploring the key materials properties that underpin the function of semiconductors and transistors.

Semiconductors & Transistors

Producing the next generation of integrated circuits and transistors hinges upon overcoming mounting pressure for improved processing power, smaller size and lower energy consumption. Researchers already effectively utilize a wide range of materials to meet these challenges, including silicon, germanium, gallium arsenide and even organic compounds. Materials for Performant Design explores the interactions that lead to device function based on these core materials, assisting teams in fine tuning their properties to suit specific end cases and respond to shifts in supply chain availability.

- Elucidate the device characteristics that define electronic properties
- Determine the impacts of defects on performance
- Evaluate oxide-oxide interfaces
- Design and assess ALD, CVD precursors
- Determine density of states and band gap (with offset)
- Calculate band offsets for semiconductor pairs
- Calculate the valence and conduction band offsets for pairs of semiconductors with matching lattice parameters
- Photoresist analysis and gas diffusion analytics
- Calculate electron mobility and effective mass
- Assess electron transport to generate IV curves
- Determine optical properties to measure sensing capability
- Predict emission spectra for transistor materials for use in display technologies
- Design thin-film transistors to confirm effects of sputtering on crystal form

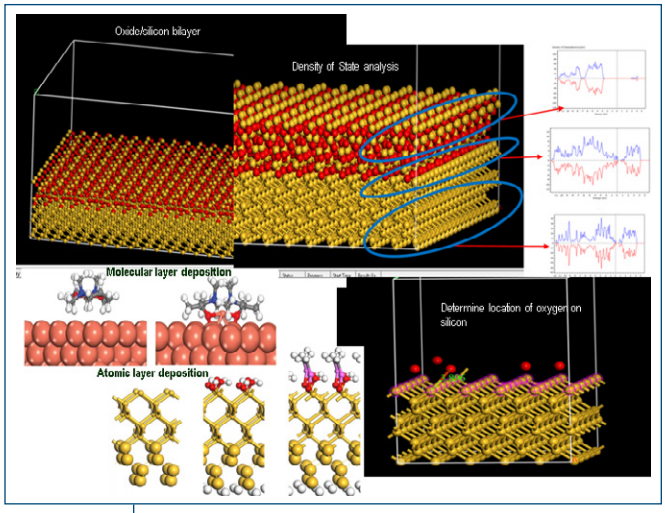


Figure 1. Various simulations of intermolecular interactions at the semiconductor surface.

Packaging

Keeping up with the increasing demand for improved device speed and functional density goes beyond semiconductor design. Packaging materials must also become smaller, thinner and less expensive while maintaining existing levels of equipment protection and sustainability. Materials for Performant Design allows researchers to characterize pure and blended packaging materials at various time and length scales to ensure their offerings meet and exceed downstream customer demands.

- Predict how resins undergo thermal expansion during curing to determine methods to improve packaging processing
- Explore ways to improve stability and moisture dependency by assessing the adhesion of resins with metal surfaces
- Calculate the structural and electronic properties of solder joints

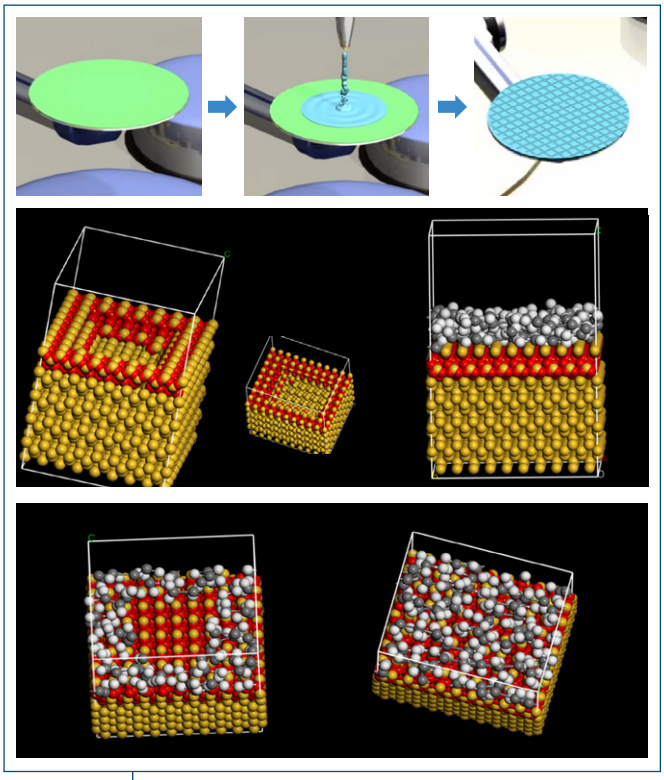


Figure 1. Simulating gas deposition in the manufacturing of a wafer.

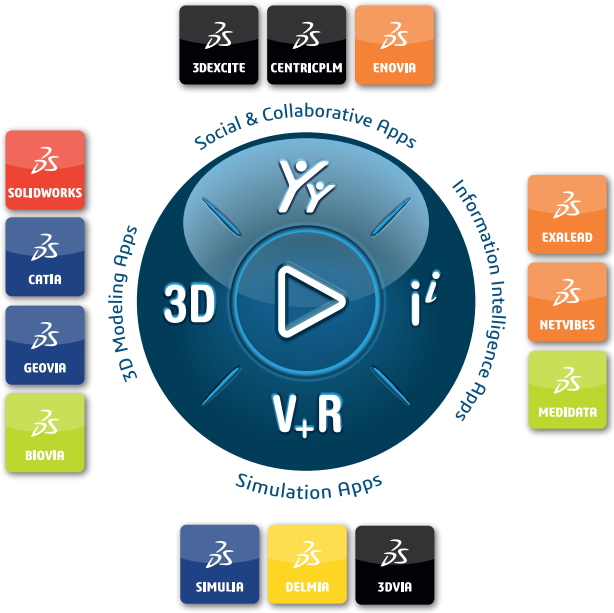
SUPPORTING THE HOLISTIC DESIGN OF ELECTRONICS

The modern era and the technology that supports it – from wearable devices to artificial intelligence – all rely on high performance electronic devices. This dynamic and constantly accelerating space is leaning on teams in the HT industry to produce commensurately innovative components and devices. Materials for Performant Design from BIOVIA provides the needed boost to drive this innovation. With the insights it provides to researchers, teams can elucidate the fundamental mechanisms that underpin device performance, leading to smaller, faster and more energy-efficient

Our **3D**EXPERIENCE® Platform powers our brand applications, serving 11 industries, and provides a rich portfolio of industry solution experiences.

Dassault Systèmes, the **3D**EXPERIENCE Company, is a catalyst for human progress. We provide business and people with collaborative virtual environments to imagine sustainable innovations. By creating 'virtual experience twins' of the real world with our **3D**EXPERIENCE platform and applications, our customers push the boundaries of innovation, learning and production.

Dassault Systèmes' 20,000 employees are bringing value to more than 270,000 customers of all sizes, in all industries, in more than 140 countries. For more information, visit **www.3ds.com**.



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