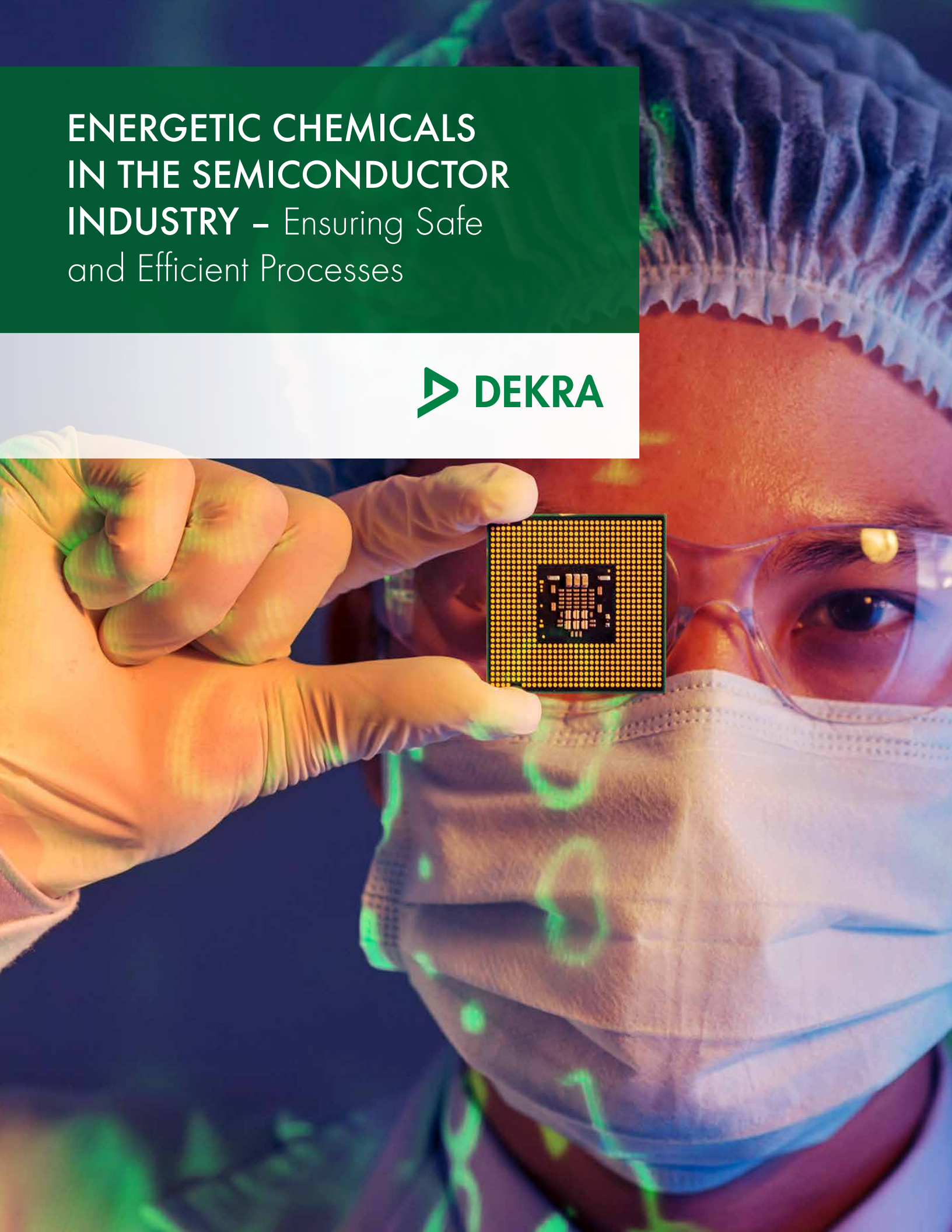


ENERGETIC CHEMICALS IN THE SEMICONDUCTOR INDUSTRY – Ensuring Safe and Efficient Processes



Process Safety in the Semiconductor Industry

Understanding and avoiding the risks of explosions and fires in order to improve performance in the semiconductor industry.

As in every process and manufacturing industry, process safety in the semiconductor sector requires that all credible operational hazards are evaluated and that a suitable basis for safe operations is determined and implemented.

Semiconductor manufacturing faces a particular set of challenges as it seeks to maintain its safety standards and minimize harm to people and the environment. This is chiefly because its processes often involve the use of highly flammable, pyrophoric, and water-reactive chemicals in exothermic reactions that demand special attention to ensure safe handling. Another area of concern, whether in semiconductor manufacturing or R&D, is that some process chemicals produce extremely dangerous byproducts. While the hazardous properties of most commonly used chemicals are well documented, the speed of innovation in the semiconductor industry frequently leads to the use of new and evolving chemicals with unknown properties. Complicating the risks are tight product development timelines and fierce competition. We understand these constraints, and we know as well that safe

operations cannot be achieved without a thorough understanding of the hazardous properties of all materials, familiar and unfamiliar, used in chemical processes and present in their byproducts.

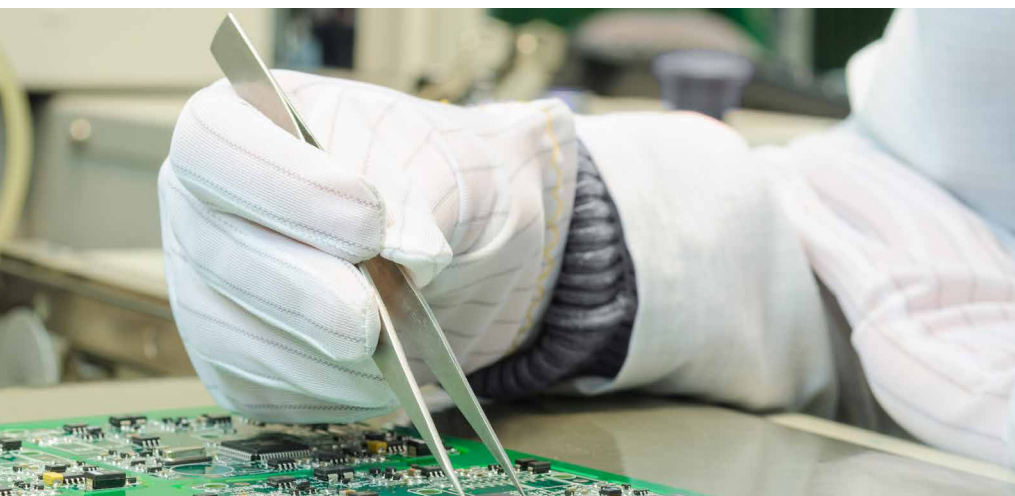
Full-Scale Testing of Materials

Our comprehensive services for semiconductor industries help you to understand and manage the risk of fires, explosions, and accidental releases of materials and energy potentially harming personnel and equipment. Apart from ASTM standard tests such as measurement of the autoignition temperature and **temperature limits of flammability**, we provide specialized testing for new and evolving chemicals in order to obtain relevant process safety data and to ensure their safe use in a manufacturing environment. Additionally, we offer support with transportation and exothermic chemical reaction testing, guaranteeing safe scale-up and operation of chemical processes.

On-Site Audits

Our experienced consultants can audit manufacturing facilities to ensure compliance with applicable national and local codes, and specify safety-related equipment such as emergency relief vents to be used on production equipment. We carefully review the overall arrangements of each facility and pay special attention to making certain that protective measures, whether mechanical mechanisms, gas detection or alarms, are appropriate and proportionate to the degree of hazard. Our extensive experience in working with chemical suppliers serving the semiconductor industry has enabled us to become knowledgeable about the chemistries used in the industry and has allowed us to develop many special capabilities tailored to semiconductor manufacturing. We have gained a depth of understanding of chemical reactions that we apply when making recommendations regarding safety improvements in both the design and operation of facility systems and processes. Our priority is incident prevention coupled with strong incident response procedures for emergency scenarios.

DEKRA Process Safety is an industry-leader in expertise relating to the safe handling, use, transport, and storage of hazardous and energetic materials in all phases of semiconductor research and development as well as manufacturing processes. We understand the complexities facing the semiconductor industry when it comes to achieving safety objectives and have the capacity, know-how and drive to support our clients as trusted advisors and



reliable experts. We have consulting offices in the United States, Europe, and Asia as well as state of the art ISO 17025 and GLP accredited laboratories and remotely located large-scale facilities for testing and evaluation. Our services for the semiconductor industry include:

- > Providing the required laboratory and full-scale testing and evaluation of material for their “energetic” properties
- > Providing safety recommendations for the safe supply, storage, handling, processing, and post processing of energetic materials according to applicable national and international codes, regulations, standards, and best industry practices
- > Providing training to the technical and operating staff on the safe handling and processing of energetic materials

Our specialist laboratory and full-scale testing services include:

Standard Physical and Chemical

Properties:

- > Flash point
- > Autoignition temperature
- > Temperature limits of flammability
- > Limits of flammability (lower and upper flammability limits) in air
- > Limiting oxidant concentration (LOC)
- > Conductivity
- > Vapor pressure
- > Boiling point
- > Melting point



Specialist Testing:

- > Modified flash point in a dry, H₂O-free atmosphere
- > Limits of flammability at elevated temperatures and/or pressures
- > Limits of flammability in alternate oxidizers such as O₂, N₂O, Cl₂, and F₂
- > Limiting oxidant concentration (LOC) at elevated temperatures and/or pressures
- > Limiting oxidant concentration with alternate oxidizers such as O₂, N₂O, Cl₂, and F₂
- > Autoignition temperature at elevated pressure
- > Chemical compatibility testing in simulated process gases, including O₂, N₂O, NF₃, Cl₂, F₂ and NH₃
- > Customized, large-scale testing

Transportation Testing:

- > Dangerous when wet test
- > Skin corrosivity test
- > Solid and liquid oxidizing substances tests
- > Adiabatic storage test
- > Shock test
- > Sustained combustibility test
- > Pyrophoric solids and liquids tests
- > Self-heating substances test

Exothermic Chemical Reaction Testing:

- > Differential scanning calorimetry (DSC)
- > Reaction calorimetry (RC-1)
- > Accelerated rate calorimetry (ARC)
- > Vent sizing package (VSP)
- > Adiabatic pressure Dewar calorimetry
- > Carius tube
- > **Thermal stability**

Would you like to get more information?

Contact Us

www.dekra-process-safety.com

DEKRA Process Safety
113 Campus Drive,
Princeton, NJ 08540
Tel : (+1) 609-799-4449
Fax : (+1) 609-799-5559

process-safety-usa@dekra.com
www.dekra-process-safety.com

