

### 3. Fundamentals of Glass Technology and Applications for Advanced Semiconductor Packaging

**Course Leader:** *Dr. Prakash Gajendran and Joseph Canale – Corning, Inc.*

#### **Course Objective:**

This course is intended to guide technologists toward a deeper understanding of how to leverage engineered glass as a material for advanced IC packaging applications. Following a review of the fundamental principles of glass structure, composition, and properties, we will discuss the unique attributes that make glass an enabling material: including strength and reliability, chemical durability, thermal behavior, associated thermal relaxation behavior, and electrical properties. In addition, we will review the “glass toolkit” as a platform alternative for semiconductor packaging development including various manufacturing (glass melting and forming) approaches, the diversity of compositional options, and a survey of glass processing approaches that can be adapted from adjacent glass technology spaces to advanced semiconductor packaging. Finally, a series of case studies will illustrate how glass is contributing to emerging technologies in the microelectronics space and explore current and potential applications in advanced semiconductor packaging, consumer electronics, and internet of things (IoT) applications. Examples include the role of glass as a carrier for temporary bonding, integrated glass wafers for optical sensors and augmented reality, key components in RF communications, as well as glass interposers for 2.5D and 3D packaging.

#### **Course Outline:**

1. Fundamentals of Glass
  - What is Glass?
  - Overview of Glass Attributes
2. Versatility of Glass
  - Glass Composition Review
  - Melting and Forming Process
  - Overview of Major Forming Processes
  - Secondary Processes
  - Options for Enhanced Properties
3. Major Applications and Markets
  - Wafer-Level Optics
  - Semiconductor
  - Case Studies

#### **Who Should Attend:**

Engineers, technical managers, scientists, buyers, and managers involved in materials, research and development, as well as advanced semiconductor packaging. We welcome individuals or companies with little or no experience in using glass

#### **Bio:**

**Prakash Gajendran, PhD**, is a Global Applications Engineering Manager in Corning Incorporated’s new business unit called Precision Glass Solutions. Precision Glass Solutions offers industry-leading glass-enabled solutions for semiconductor, consumer electronics, and Internet of Things (IoT) applications. Currently, Prakash is responsible for design-in and customer engagement activities for Corning’s glass solutions across multiple product lines.

Prakash has earned a B.S. in Mechanical Engineering from Vellore Institute of Technology, India. He holds a M.S. in Mechanical Engineering from Indian Institute of Technology and a Ph.D. in Mechanical Engineering from West Virginia University. In 2015, Prakash earned M.B.A

from Kenan-Flagler business school, University of North Carolina, Chapel Hill. He has successfully managed multiple customer design-in projects and commercialized products across a variety of applications from environmental solutions to mobile phones to semiconductors.

**Joseph Canale**, is a graduate of Alfred University and is currently working as a Sr Applications engineer at Corning Specialty Materials in the Elmira, New York Area.