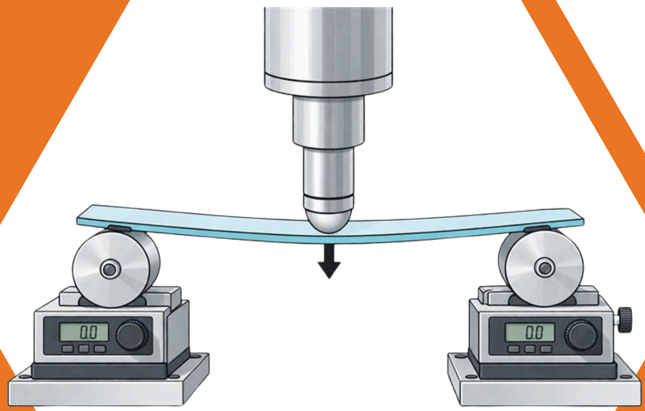
FLUOROCARBON

CASE STUDY

LOW-FRICTION FLUOROPOLYMER TAPE FOR SEMICONDUCTOR FLEXURAL TESTING



OVERVIEW

A global semiconductor equipment manufacturer required a thin fluoropolymer-based interface material to improve the accuracy and repeatability of mechanical flexural testing on glass substrates used in advanced fabrication processes. The challenge centred on engineering a material system that could minimise friction-induced measurement error while operating within strict geometric and mechanical constraints.

The material was required for use within semiconductor R&D test equipment, where it would act as a controlled interface between the compression surface and the glass specimen, decoupling friction from the measurement, ensuring that recorded forces reflect true material behaviour. In this environment, even minor variations in surface interaction can significantly impact data accuracy.

THE ENGINEERING CHALLENGE

In high-precision flexural testing, friction between the specimen and the test fixture introduces parasitic forces that can distort results. Eliminating this variable is essential to achieving reliable, repeatable data.

The customer required an adhesive-backed fluoropolymer layer that could function as a controlled slip interface. However, the performance criteria were tightly interdependent:

- Friction had to be consistently low to avoid measurement interference
- Elongation needed to be high to accommodate deformation under load
- Adhesion had to be minimal to prevent influence on the test outcome
- Dimensional stability was required during dynamic movement

Overlaying these requirements was a critical constraint: total construction thickness had to remain below approximately 64 µm, including the adhesive layer. This limitation ruled out most conventional PTFE tape constructions and required a more advanced material design approach.

OUR APPROACH

Rather than treating the enquiry as a request for an off-the-shelf PTFE tape, the approach focused on understanding how the interface behaves within the system.

Initial evaluation confirmed that while standard fluoropolymer constructions could meet tribological and mechanical requirements, they exceeded the allowable thickness. This reframed the challenge from material selection to material engineering.

The solution strategy centred on optimising the material stack:

- Thin-film fluoropolymer engineering to retain low-friction performance at reduced thickness
- Adhesive layer optimisation to minimise thickness while maintaining stability during testing
- Controlled balance of adhesion and slip to ensure the material remained in place without influencing results
- Material selection refinement, including evaluation of PTFE and alternative fluoropolymer options

Through this approach, a new product was developed that met the full specification, including achieving a total thickness of ≤ 64 µm, while preserving the required mechanical and surface performance.

THE SOLUTION

A fully compliant fluoropolymer adhesive tape was successfully developed and supplied as samples for evaluation. The solution achieved the required thickness constraint of ≤ 64 µm while maintaining low friction, appropriate adhesion characteristics, and mechanical compliance.

By engineering the interface as part of the system rather than treating it as a consumable, the solution supports improved test fidelity and repeatability. This demonstrated that the application challenge could be resolved through targeted material engineering, rather than compromise on performance or geometry.

Beyond the immediate application, the work established a scalable solution pathway. If validated, the material has the potential to be standardised within testing procedures or integrated into equipment design, extending its value across multiple systems.

WHY FLUOROCARBON

Fluorocarbon’s approach is grounded in engineering, not product matching. This project highlights key capabilities:

- **Application-led problem solving:** The focus was on understanding the mechanics of the test system and designing the interface accordingly.
- **Ability to meet tight dimensional constraints:** Successfully engineering a ≤ 64 µm adhesive-backed fluoropolymer tape demonstrates precise control over material architecture.
- **Deep fluoropolymer expertise:** Advanced understanding of PTFE and related materials enabled optimisation of friction, adhesion, and mechanical behaviour within a constrained design envelope.
- **Support for R&D and early-stage development:** Rapid sampling and technical collaboration enabled progress at a critical stage of the customer’s development cycle.

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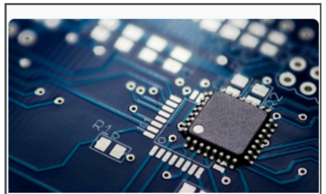

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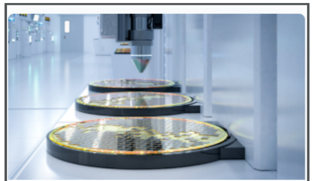

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