

# Processing III-V Semiconductors - Indium Phosphide (InP)

Indium Phosphide (InP) is used in high-power and high-frequency electronics because of its superior electron velocity. Its direct band gap also makes it useful in the production of optoelectronic devices such as laser diodes. Lasers and waveguides fabricated on InP are often utilised within fibre communications in high speed data transferring. InP wafers must be prepared prior to device fabrication, all III-V wafers must be lapped to remove the surface damage that occurs during the slicing process. Wafers are then Chemically Mechanically Polished/Planarization (CMP) for the final material removal stage allowing the attainment of super-flat, mirror-like surfaces with a remaining roughness on an atomic scale. The wafer is then ready for device fabrication.



## Lapping



'Lapping' is a material removal process typically involving counter rotating plates and an abrasive with a defined grain sized distribution for effective material removal with minimal surface damage. Semiconductor wafers, such as InP, must go through two lapping stages to prepare for CMP. During lapping the flatness and micro-roughness of the wafers are greatly improved.

For processing InP a Logitech glass lapping plate is used in conjunction with an Alumina based lapping abrasive for both lapping stages on the PM6 Precision Lapping & Polishing system.

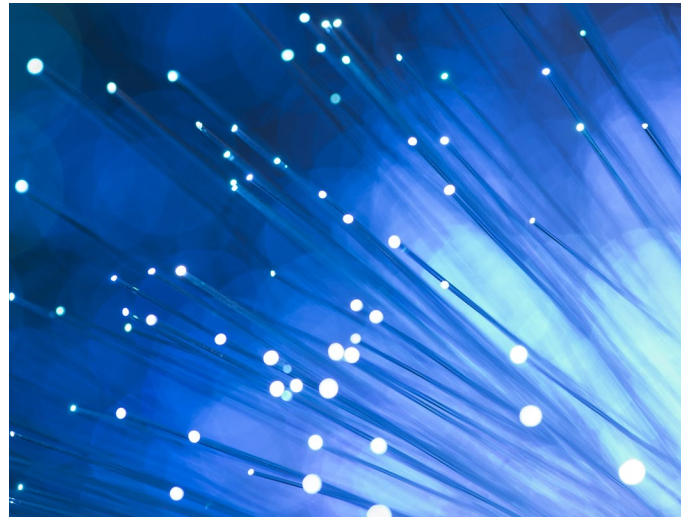
A convex plate must be used for the lapping process in order to produce a concave sample. The sample must be concave to accommodate for sample edge rounding which will occur in the final CMP stage in order to counter act the sample edge rounding to produce a perfectly flat wafer.

The convexity of the plate can be easily achieved to the desired measurement through intelligent automated features of the PM6. The digital Bluetooth enabled plate flatness monitor and plate conditioning test block can run together until the plate reaches the targeted plate shape (set by the operator on the graphical user interface). The process will then automatically stop to avoid over-conditioning.

# Polishing

The final processing stage is Chemical Mechanical Polishing/Planarization (CMP). This is often seen as the most important stage as this prepares the wafer face for device fabrication. Typically this stage results in minimal material removal and removes subsurface damage that may have occurred in the lapping stages.

As the PM6 is a dual lapper and polisher, the full process can be carried out on this system. It simply involves the lapping plate to be exchanged for a polishing plate with polishing pad. The PM6's intelligent features are designed to cut processing time and provide industry standard results for both processes.



InP WAFERS ARE UTILISED IN HIGH SPEED FIBRE COMMUNICATIONS APPLICATIONS

A Logitech polishing pad is utilised in this process with the Logitech polishing slurry. The volume of slurry delivered to the pad can be easily controlled via the graphical user interface of the PM6 via the metered abrasive feed unit, reducing wastage for improved cost reductions. Plate speeds of up to 100rpm can also be set allowing the operator total control over the process.

Further improvements can also be made utilising Chemical Polishing (CP) on CP specific tools. For more information on CP - [visit our website](#).

## Customer Trials

A Logitech customer required a process for 2"/50mm InP wafer samples. Following the methods outlined above, the following results were achievable:

	Lapping Stage 1	Lapping Stage 2	CMP Stage
Roughness Ra	250 - 350 nm	200-350 nm	1-2 nm
Final Sample Thickness	x	x	150 $\mu$ m
Total Thickness Variation (TTV)	3 $\mu$ m	3 $\mu$ m	1 $\mu$ m

Logitech provide full system solutions for the process of III-V Semiconductors and will provide you with the processes to meet the strict tolerances you require for your applications needs. If you are interested in learning more [get in touch with one of our technical experts here](#).

