

# Novel Materials Processing

## CMP Applications for Novel Materials

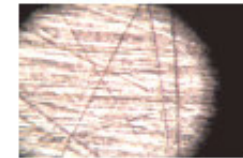
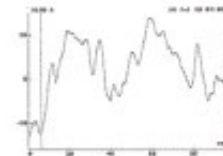
### Industry Problem

Many new device structures including alternative substrate materials, particularly sapphire and III-V materials such as silicon germanium, gallium nitride, etc., and metals encompassing a wide range of materials, are currently being developed. Processes for such materials often benefit from CMP's proven advantages of planarization and surface quality management, however, no established process specifications typically exist for these relatively novel materials.

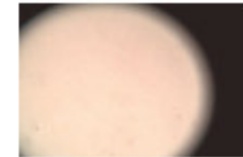
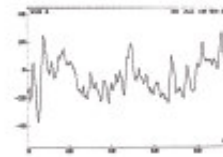
### Axus Solution

Axus Technology has developed and demonstrated viable CMP processes for a number of such materials and applications. The example shown here is Kovar.

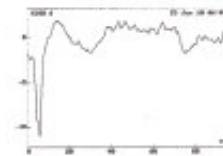
Kovar is an iron-nickel-cobalt alloy with a CTE similar to that of borosilicate glass, which makes it suitable for use in sealing device cavities in MEMS-type structures. A CMP process has been successfully demonstrated for Kovar wafer processing. Multiple candidate slurry formulations were identified, tested and characterized based on their chemical and abrasive properties. Relevant process results are summarized and compared below.



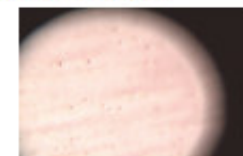
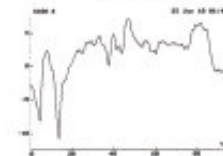
Re-processing scan RA = >900A -- Surface showing very rough scratched cross hatching patterns.



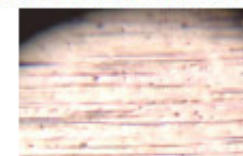
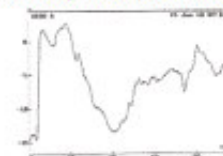
Post-process using Slurry 1 - Post CMP Roughness = 93A Ra, Removal Rate = 6.6  $\mu\text{A}/\text{min}$ . Surface showing much improved finish, high removal rate, good surface quality.



Post-process using Slurry 2 - Post CMP Roughness = 121A Ra, Removal Rate = 4.0  $\mu\text{A}/\text{min}$ . Surface showing some improvement, heavy pitting caused by the slurry.



Post-process using Slurry 3 - Post CMP Roughness = 220A Ra, Removal Rate = 0.5  $\mu\text{A}/\text{min}$ . Surface showing limited improvement, extremely low removal rate and signs of pitting caused by the slurry.



Post-process using Slurry 4 - Post CMP Roughness = 335A Ra, Removal Rate = 3.3  $\mu\text{A}/\text{min}$ . Surface showing limited improvement, low removal rate and signs of pitting caused by the slurry.