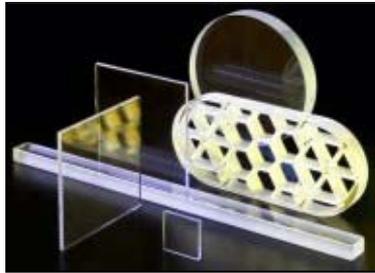


# Ultra Low Thermal Expansion material “CLEARCERAM<sup>®</sup>-Z HS” for EUVL

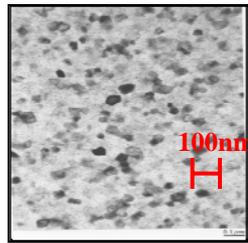
Yoshiyuki Owari, Kousuke Nakajima, Nobuo Kawasaki  
 OHARA, Incorporated

< ABSTRACT >

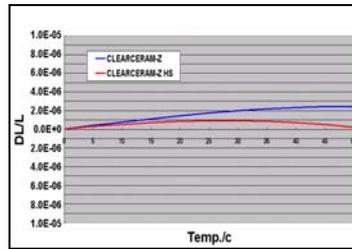
OHARA Inc. has been supplying low thermal expansion glass-ceramics material products “CLEARCERAM<sup>®</sup>-Z” series. For EUVL applications, CLEARCERAM<sup>®</sup>-Z HS was found to be most suitable among materials in the series in the past investigations, especially for the substrates of the stepper mirror, Photomask and structural component. In this presentation, we attempt to update the status of OHARA’s development activities for EUVL application with CLEARCERAM<sup>®</sup>-Z HS. The presentation is to include; the latest investigation results of inter lot uniformity of CTE property, surface finish and precision CTE measurement system at OHARA Inc.



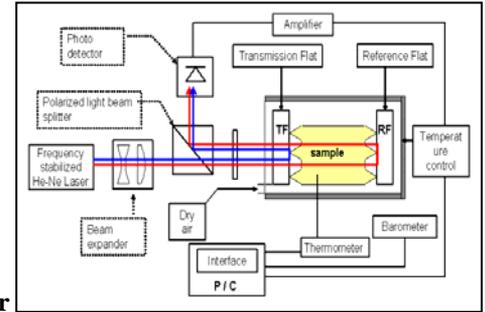
CLEARCERAM<sup>®</sup>-Z series



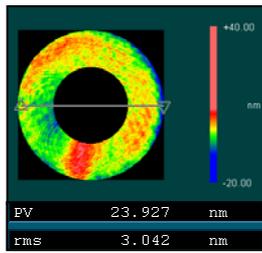
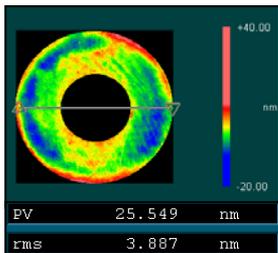
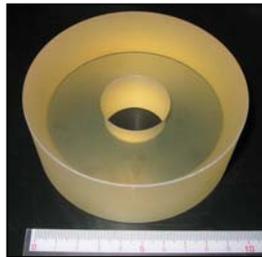
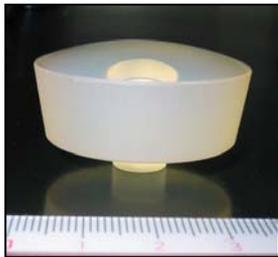
Sub-micron fine grains (TEM photograph)



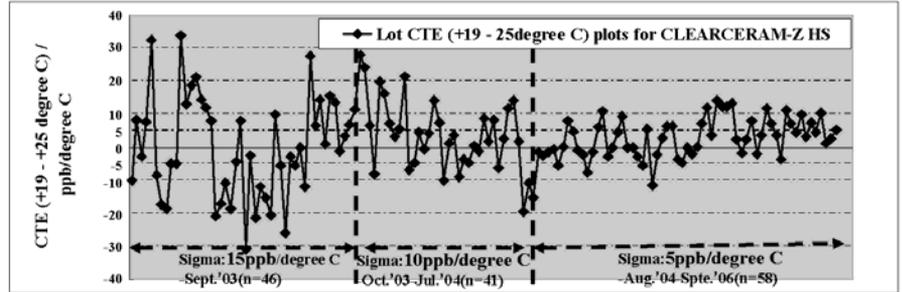
Typical dl/l vs Temp. Profile for CLEARCERAM<sup>®</sup>-Z products



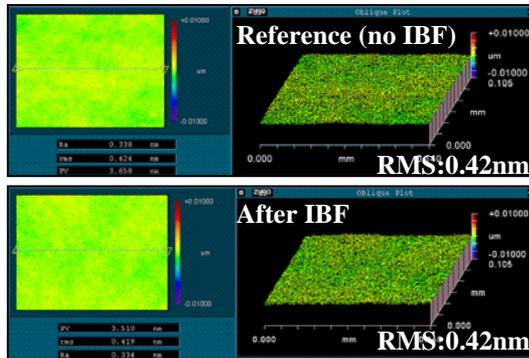
Schematic diagram of the precision CTE measurement system at OHARA inc.



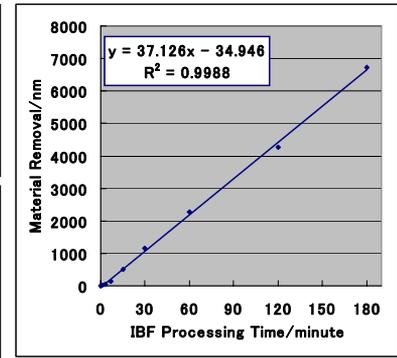
CLEARCERAM<sup>®</sup>-Z HS Schwarzschild Mirrors



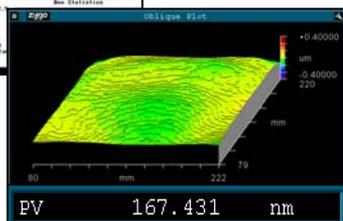
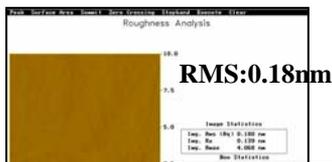
CTE inter Lot uniformity; Lot CTE (+19to+25degree C) plots for CLEARCERAM<sup>®</sup>-Z HS



Zygo New View Surface profiles of CLEARCERAM<sup>®</sup>-Z HS after IBF for 180minutes (Removal Depth:6.7 μm) and without IBF



A Linear relation between removal depth and processing time in Ion Beam Figuring of CLEARCERAM<sup>®</sup>-Z HS



Demonstration for simultaneous Achievement of Surface roughness and Flatness

< Conclusion >

The latest investigation results on CLEARCERAM<sup>®</sup>-Z HS were presented and its sophisticated property, uniformity and product quality for EUVL applications were confirmed. The development activities at OHARA Inc. for further improvements and optimization to pursue more complete fit to users’ applications are undergoing.

< Acknowledgement >

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