



**Qual Diamond**  
Hi-tech Corporation



# Advanced Ceramic Precision Polishing Case Study

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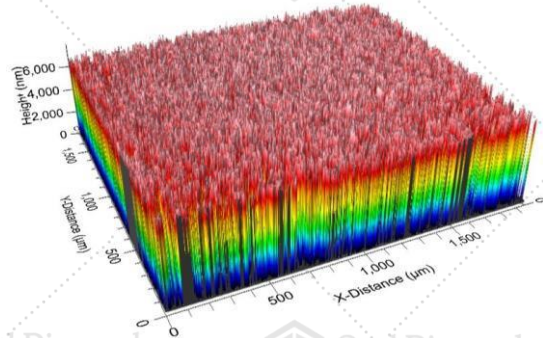
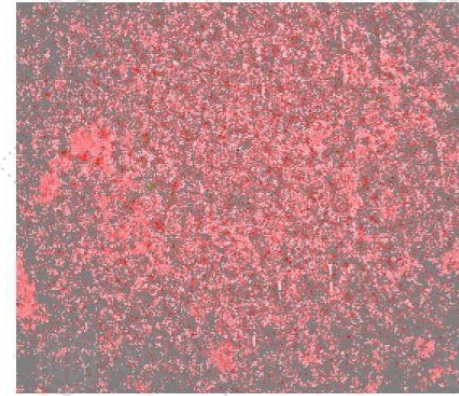
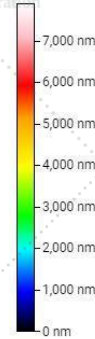
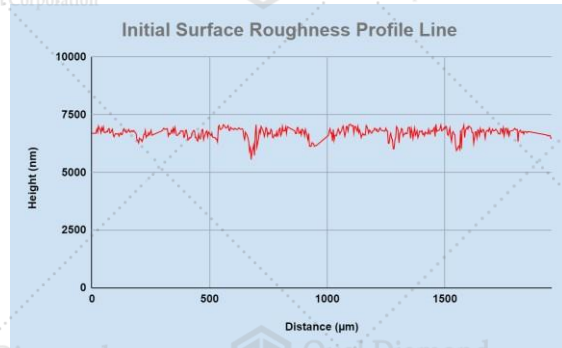
# Abstract

The main objective of this case study is to test a cost-effective and efficient Qual Diamond diamond slurry for the precision polishing of advanced ceramic materials. The select material is porous alumina substrate and was polished using a Qual Diamond polycrystalline diamond slurry. The Qual Diamond diamond slurry was able to shorten the time required for polishing and reduce a multi-step procedure to a 1-step precision polishing procedure.

# Experiment Brief

- Ceramic Substrate: Porous ceramic substrate with 1" diameter and 400  $\mu\text{m}$  thickness, composed of 99.6%  $\text{Al}_2\text{O}_3$
- Initial Ra (nm) :186 nm
- Qual Diamond polycrystalline slurry size 5-10 is used.
- The desired roughness was reached within 40 minutes of polishing.
- The results of the test show exceptional performance both in terms of parallelism and surface roughness.
- Details of the results are shown in the subsequent slides.

# Ceramic Initial Surface Inspection



- Ceramic Substrate: Porous ceramic substrate
- Initial Ra (nm) :186nm

# Polishing Apparatus & Setup



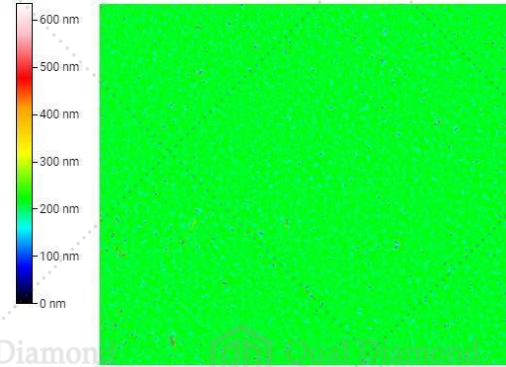
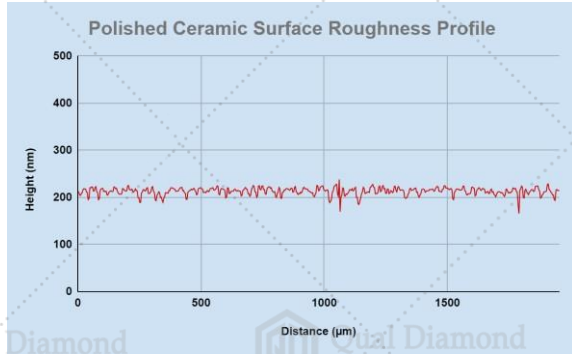
Weight

Glass plate where alumina sample is held underneath

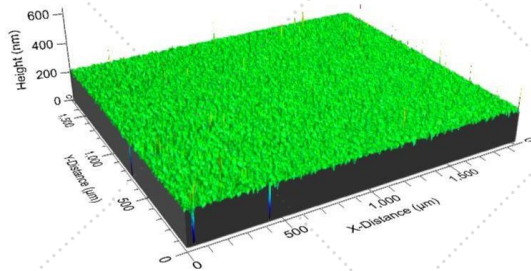
Polishing pad where diamond slurry is applied

Catch Pan

# Final Roughness Assessments

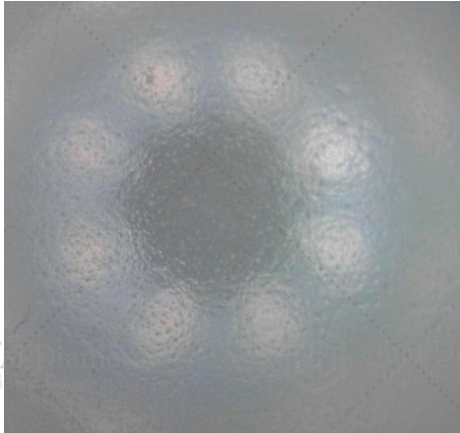


Ra = 5.7nm

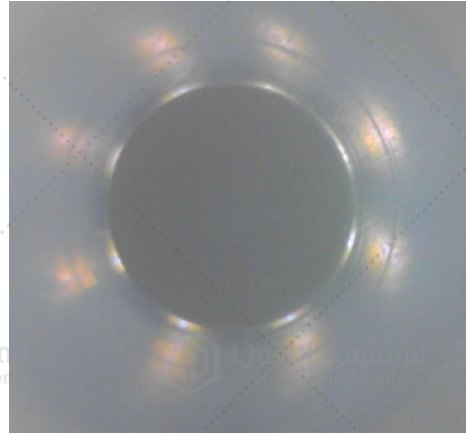


- No scratches are observed on the surface.
- Short period of time of polishing.
- More than 28 points are inspected in three samples and the Ra values in all cases is between 5.25-5.83nm.
- Typical result shown for illustration purposes.

# Before and After Comparisons



Initial Surface



Final Polished Surface  
(Mirror Surface)



A light was shined on polished and unpolished alumina samples. The polished sample reflects light like a mirror while the unpolished sample does not.

# Conclusion

- Qual Diamond diamond slurry can be used to efficiently process advanced ceramic material.
- The results show consistent surface profile along the measured surface area, indicating the planarization step is not needed.