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Development of Evaluation Method of Pad Surface Characteristics Based on Contact Image Analysis Using Image Rotation Prism

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Objective

The aim of the current study is to develop such a technique to evaluate the surface conditions of a polishing pad.
The proposed technique is based on contact image analysis using an image rotation prism.

Back ground

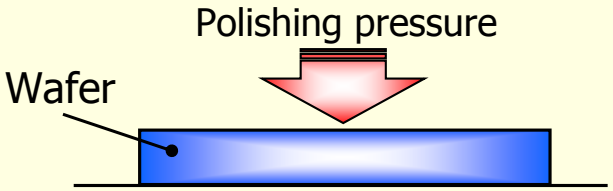
The pad surface are affected by dressing

Actual state

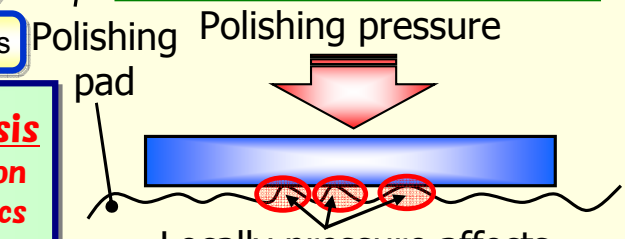
- No effective method for pad surface evaluation have been established
- It is not even clear that relationship between pad and dressing conditions

◎We propose a technique based on *contact image analysis*
◎We check up the *quantitative parameter* for *pad surface evaluation*
◎We discuss the effect of *dressing conditions* for *pad characteristics*

Apparent contact conditions



Real contact conditions



Approach

Using Image Rotation Prism

◎A type of optical glass.
◎Incident light from the side of the prism becomes to *totally reflected* at the prism bottom surface when nothing is in contact with it.
◎When there are contact points to the bottom surface of the prism, the light *diffusely reflected*.

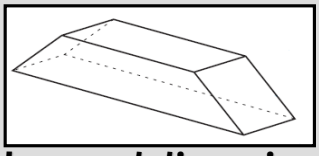
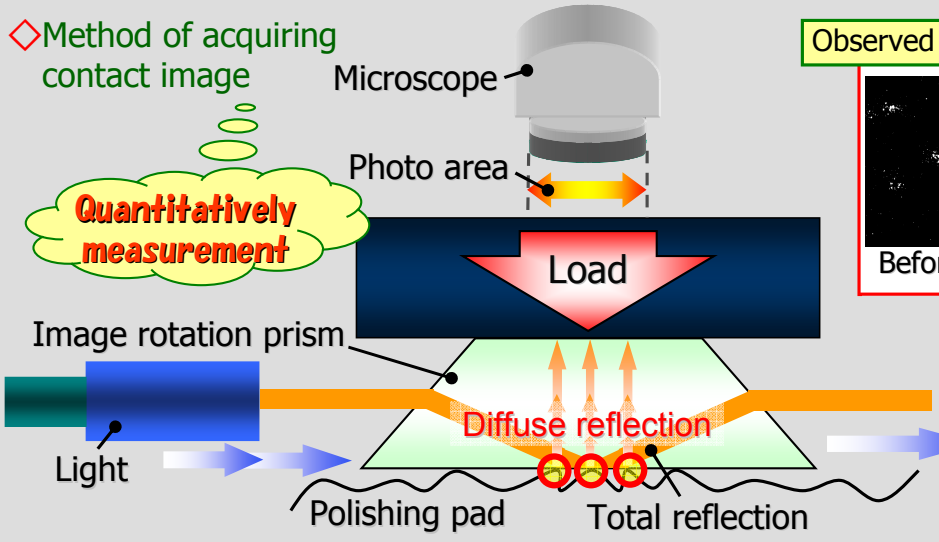
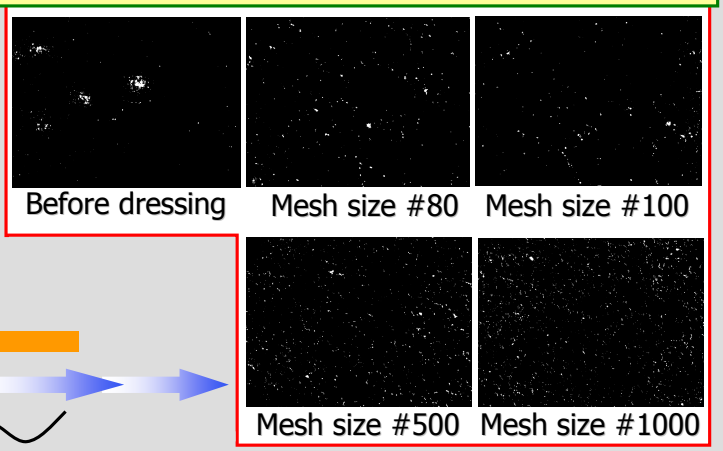


Image rotation prism

◇Method of acquiring contact image



Observed contact images for different dressing conditions



7.3mm × 5.5mm (1600pixel × 1200pixel)

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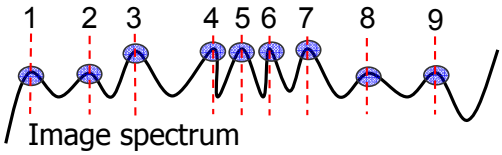
Advance of the evaluation parameters

Number of contact points

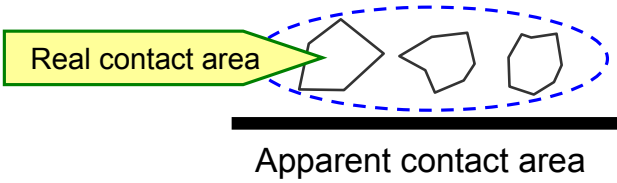
Number of white points as contact points



The number of peaks in the spectrum of the ***contact points***

Contact ratio

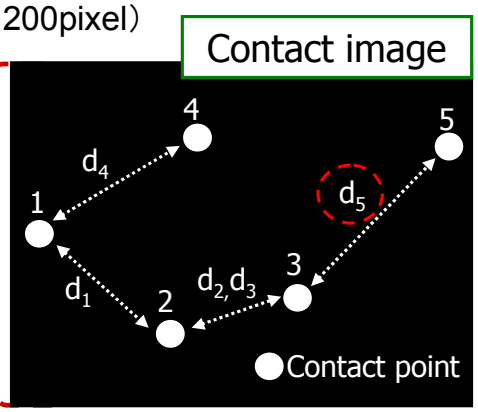
The ratio of the ***apparent contact area*** and the ***real contact area***



Maximum value of minimum spacing of contact points

The maximum in a set of the minimum of spacing of contact points

In this case, d_5 is result



Half width of peak of spatial FFT result

This parameter seems to be a quantitatively measure of the ***cohesion*** of contact points

Quantitatively evaluation results

Quantitatively evaluation of the pad could be achieved using ***our advance of the parameters!***☺

Experimental conditions

Mesh size of dresser
#80, #100, #500, #1000

Outer/ Inter diameter of dresser
100mm/ 82mm

Dressing time
60min

Dressing pressure
150gf/cm²

Dresser rotation speed
2rpm(CW)

Pad rotation speed
30rpm(CW)

Offset of dresser
125mm

Polishing pad
MH-S15A