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Effect of Pad Surface Temperature and Dry/ Wet Conditions on Pad Surface Property

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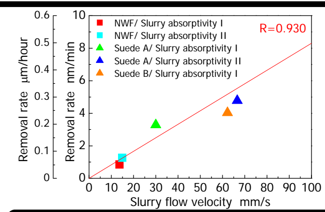
Objective

In this study, investigates the effect of the surface temperature and the dry/ wet conditions of the polishing pad on the contact interface between the substrate and the pad during a chemical mechanical polishing (CMP).

Back ground

- The sapphire crystal has been applied to the substrate of the LED. However, sapphire crystal has the excellent mechanical and chemical characteristics. Therefore, sapphire-CMP requires a long time to process.
- The polishing characteristic is affected by slurry flow.

This study aims to elucidate the relationship between the pad surface texture and the slurry flow. The study examine the impact by focusing on polishing pad.



Relationship between the removal rate and the averaged slurry velocity

Experimental method

◎ The polishing pad condition

→The using of the polishing pad are the suede and non-woven fabric

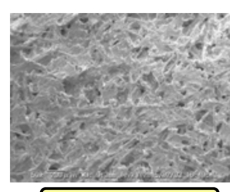
→The polishing pad conditions dry/wet conditions

→The pad surface temperature is heating the range from 22.5°C to 60°C

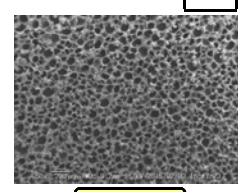
◎ The polishing pad surface texture evaluation

→The pad surface texture measuring instrument

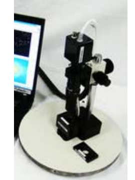
→The non-contact laser microscope (pad temperature 22.5°C)



Non-woven fabric



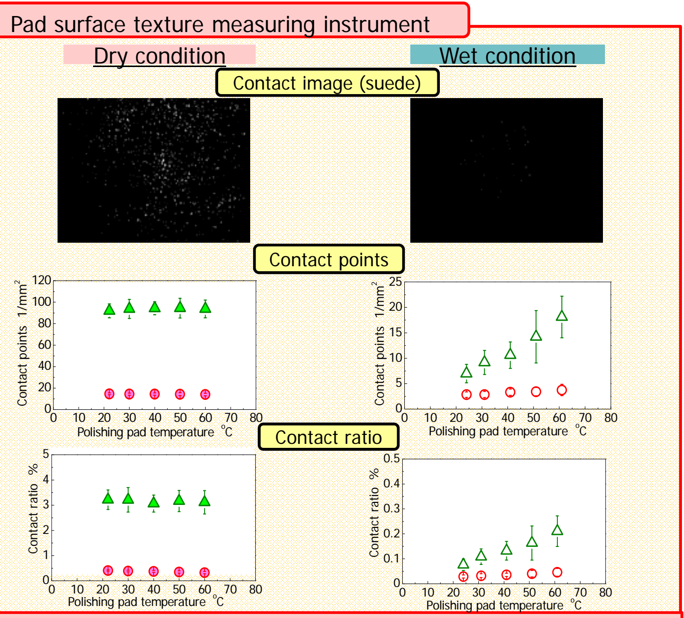
Suede



The pad surface texture measuring instrument

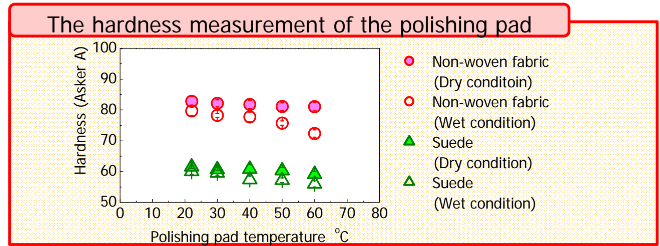
Experimental result

Pad surface texture measuring instrument



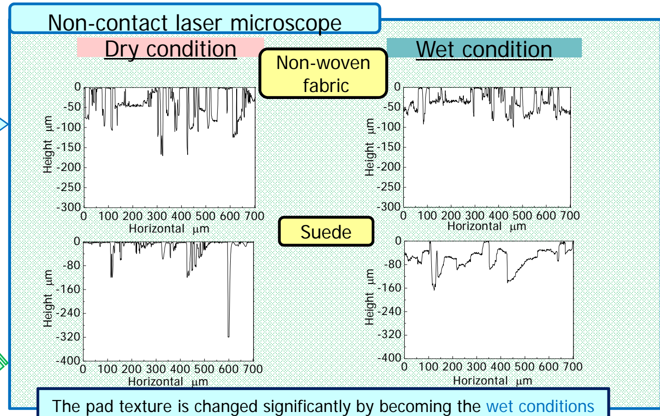
In the Dry condition, the contact ratio is independent of the pad temperature.
In the Wet condition, the contact ratio increases with the increase of the pad temperature.

The hardness measurement of the polishing pad



Verification

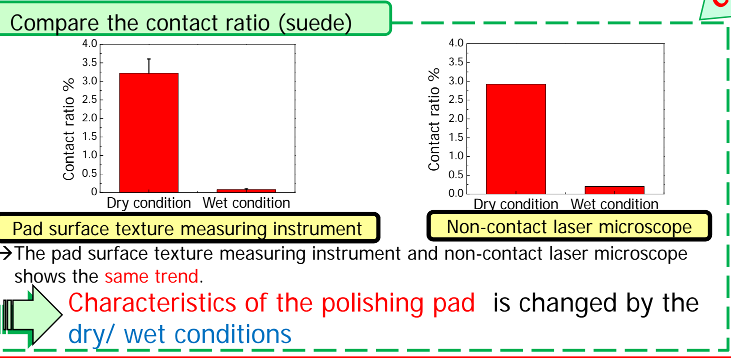
Non-contact laser microscope



The pad texture is changed significantly by becoming the wet conditions

Comparison

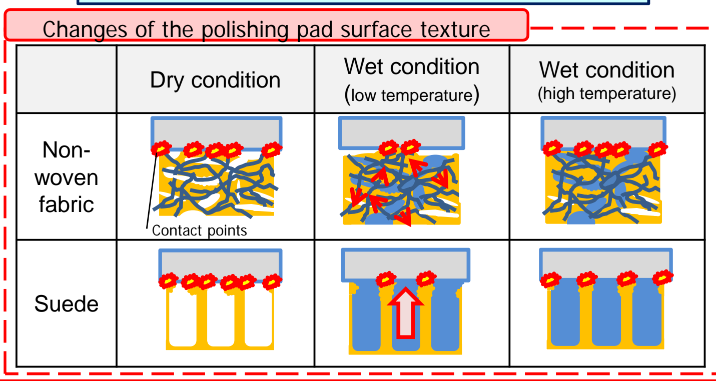
Compare the contact ratio (suede)



→The pad surface texture measuring instrument and non-contact laser microscope shows the same trend.

Characteristics of the polishing pad is changed by the dry/ wet conditions

Changes of the polishing pad surface texture



	Dry condition	Wet condition (low temperature)	Wet condition (high temperature)
Non-woven fabric	Contact points		
Suede			

Conclusion

The following are the main findings of this study.

I. Characteristics of the polishing pad is changed by the dry/ wet conditions. Therefore, CMP understanding needs to be assessed in the wet conditions.

II. In the wet conditions, the polishing pad hardness reduces with the increase of the pad surface temperature. Therefore, contact points will increase because the polishing pads flattening.