

Improvement in post-Chemical Mechanical Planarization cleaning process for Ru interconnects

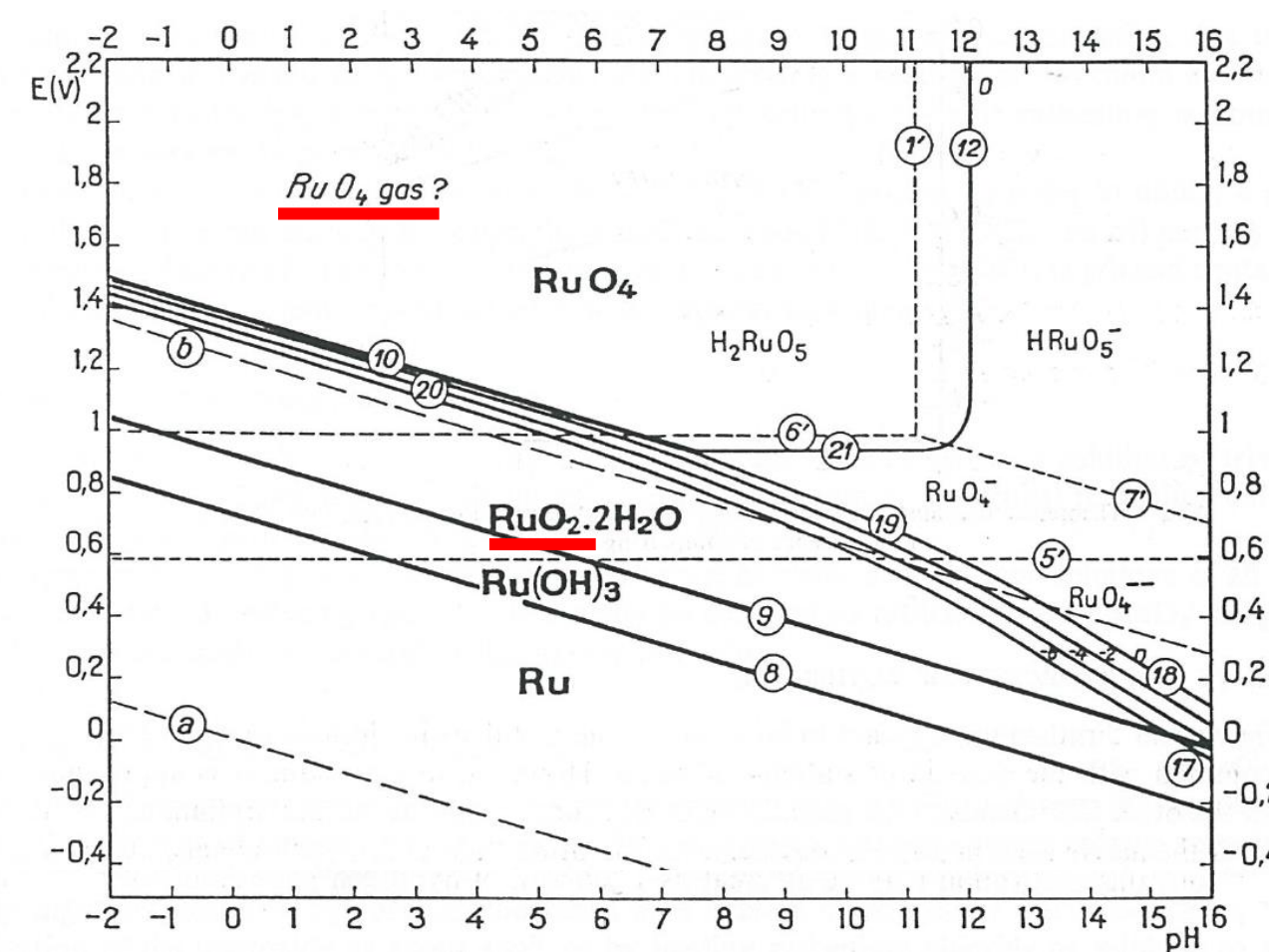
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Introduction

Motivation



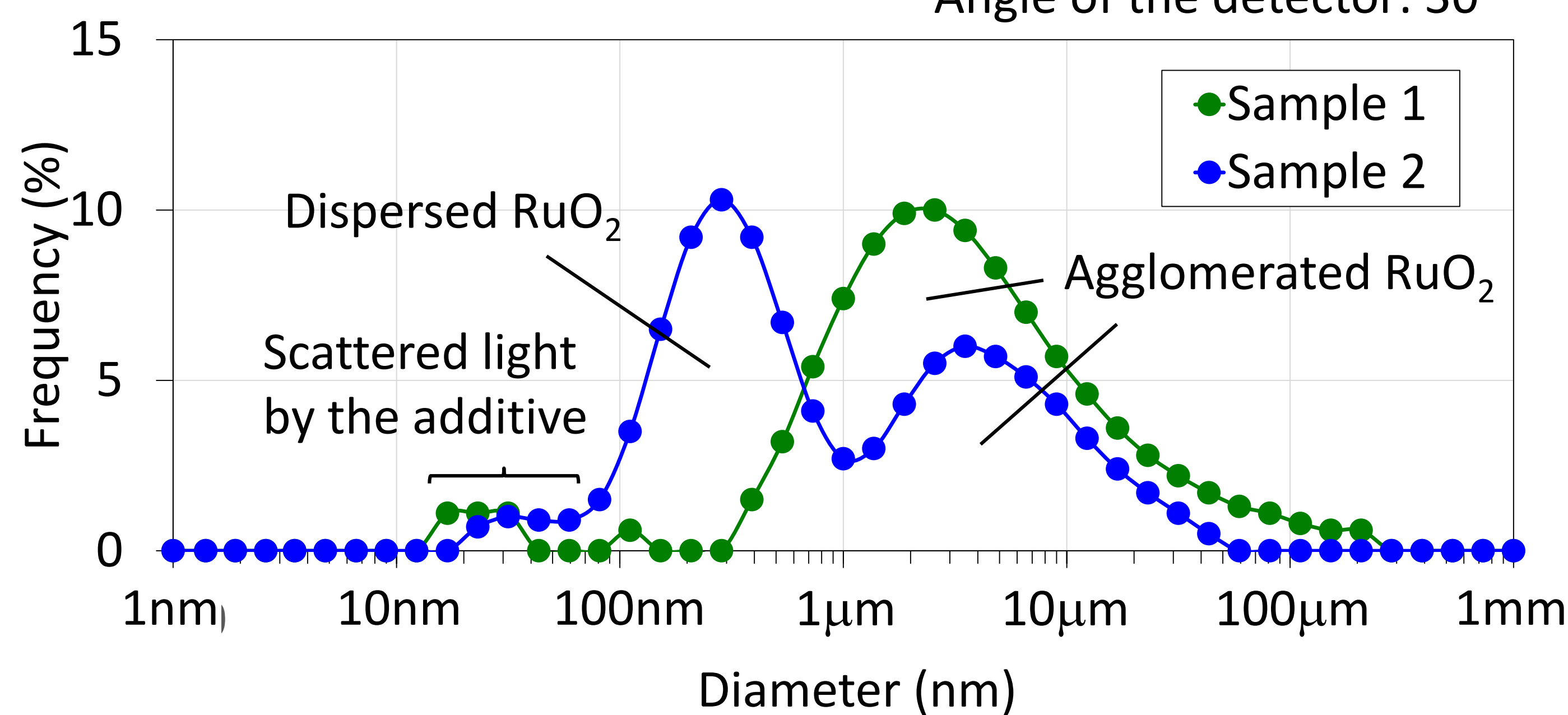
Marcel Pourbaix; Atlas of Electrochemical Equilibria in Aqueous Solutions

CMP in Acidic pH : toxic gas
CMP in Alkaline pH : RuOx (Oxide layer? Particles?)

In this investigation, we focused on removing small particles including RuOx to make an improvement in the post-CMP cleaning,

DLS (Dynamic Light Scattering)

Tool: DLS-8000 (Otsuka Electronics)
Angle of the detector: 30°

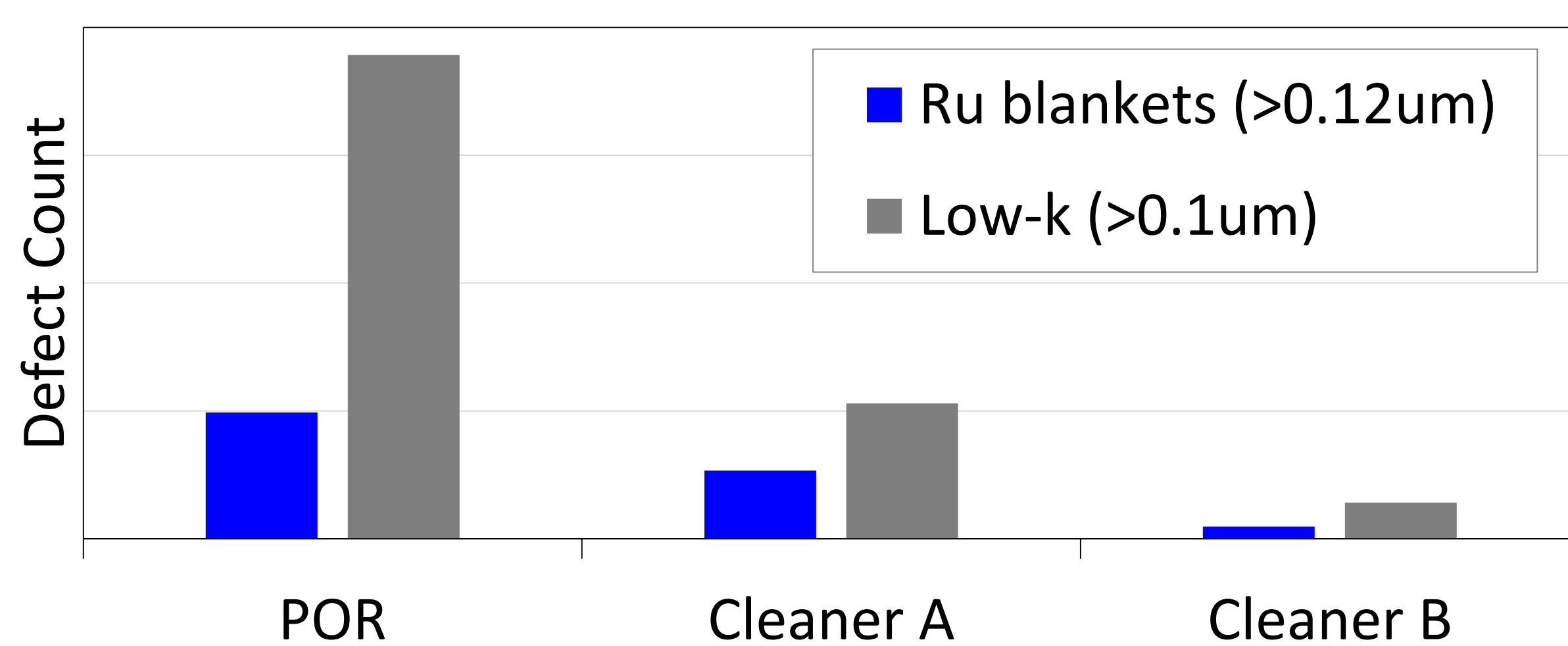


Solutions for measurement

	Sample 1	Sample 2
Alkali		X
Additive	X	X
pH	~7	10-11

post-CMP Cleaning Test

Defect count by SP2 (KLA-Tencor)

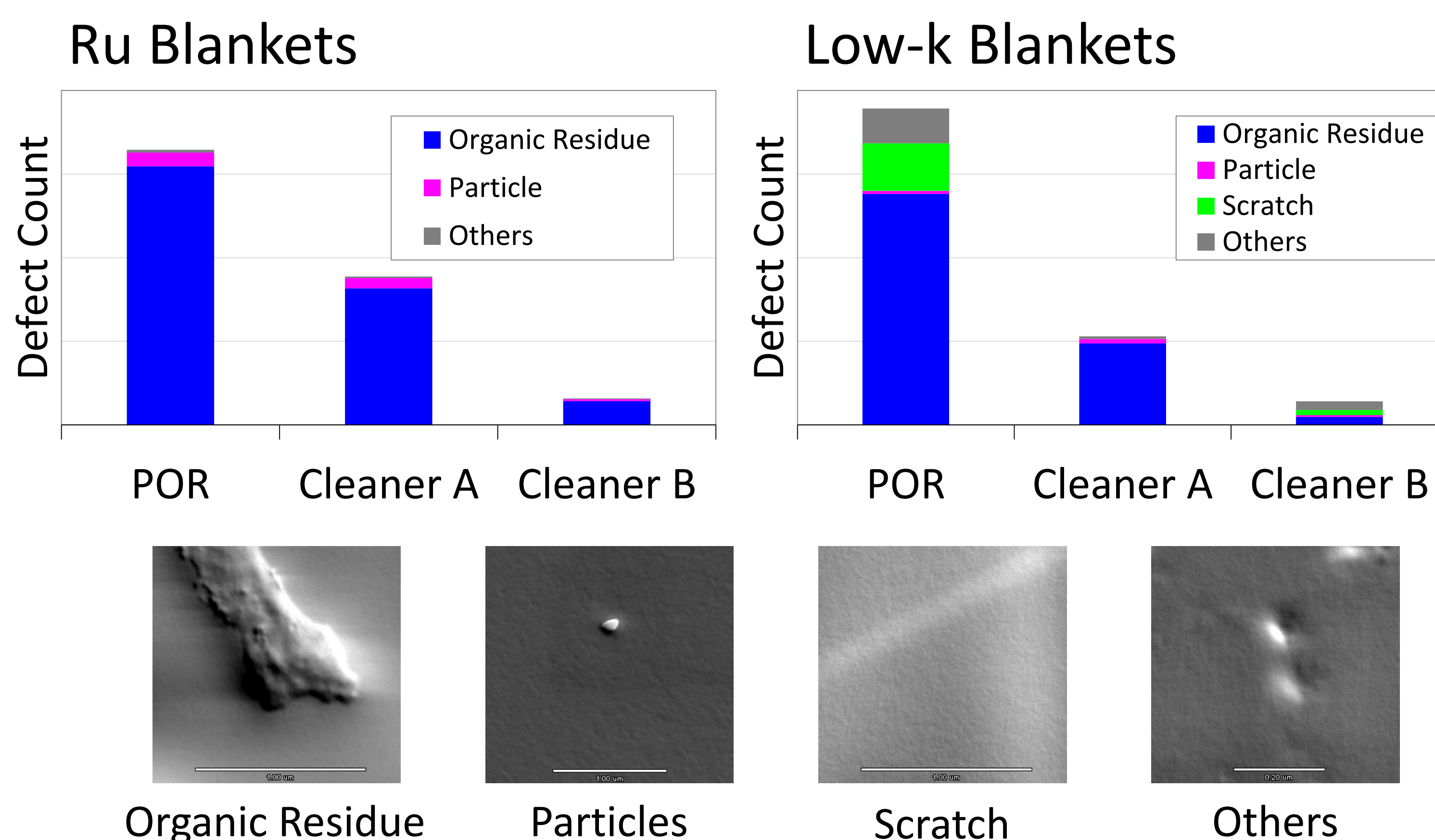


CMP related materials

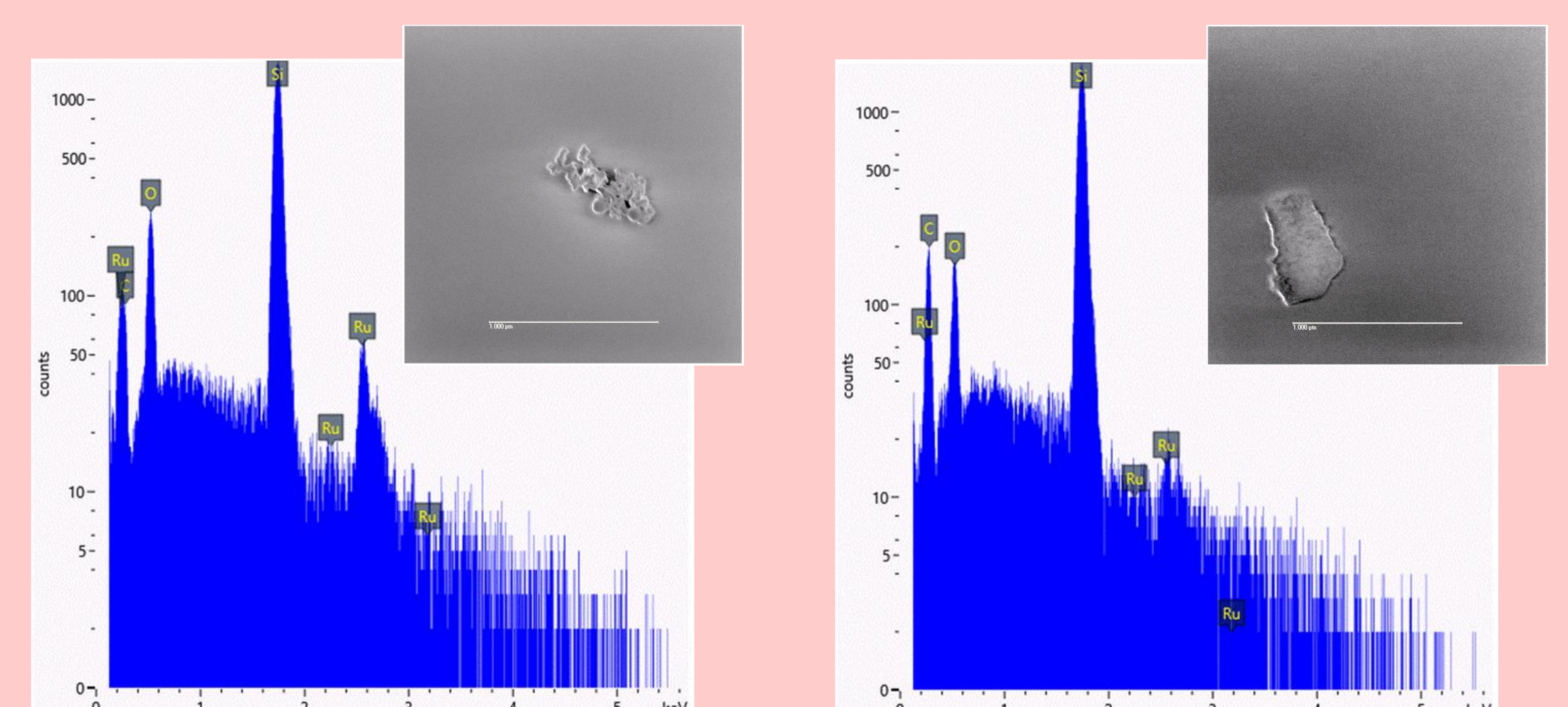
CMP tool: Reflexion LK (Applied Materials)
CMP Slurry: Alkaline
CMP Pad: Visionpad and Optivision
post-CMP cleaners: Alkaline

	Cleaner A	Cleaner B
Alkali	X	X
Chelator	X	X
Additive		X

Defect classification by EDR7100 (KLA-Tencor)



Defects with Ru on Low-k



The defects containing Ru were detected on Low-k blankets (<5%). Although it might be a cross-contamination from the CMP pads or the brush, RuOx particle can be a target of post-CMP cleaning.

Conclusion

The novel additive in cleaner B drastically contributes to removing small particles and organic residue.