

Why?

Concrete is one of the world's most used materials

Causes ~8% of global carbon emissions¹

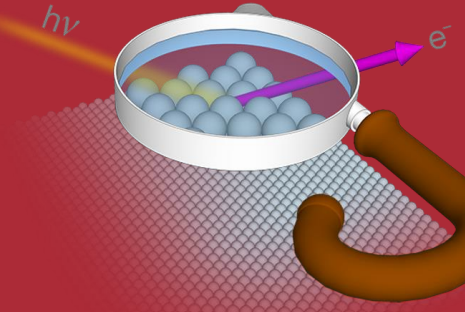
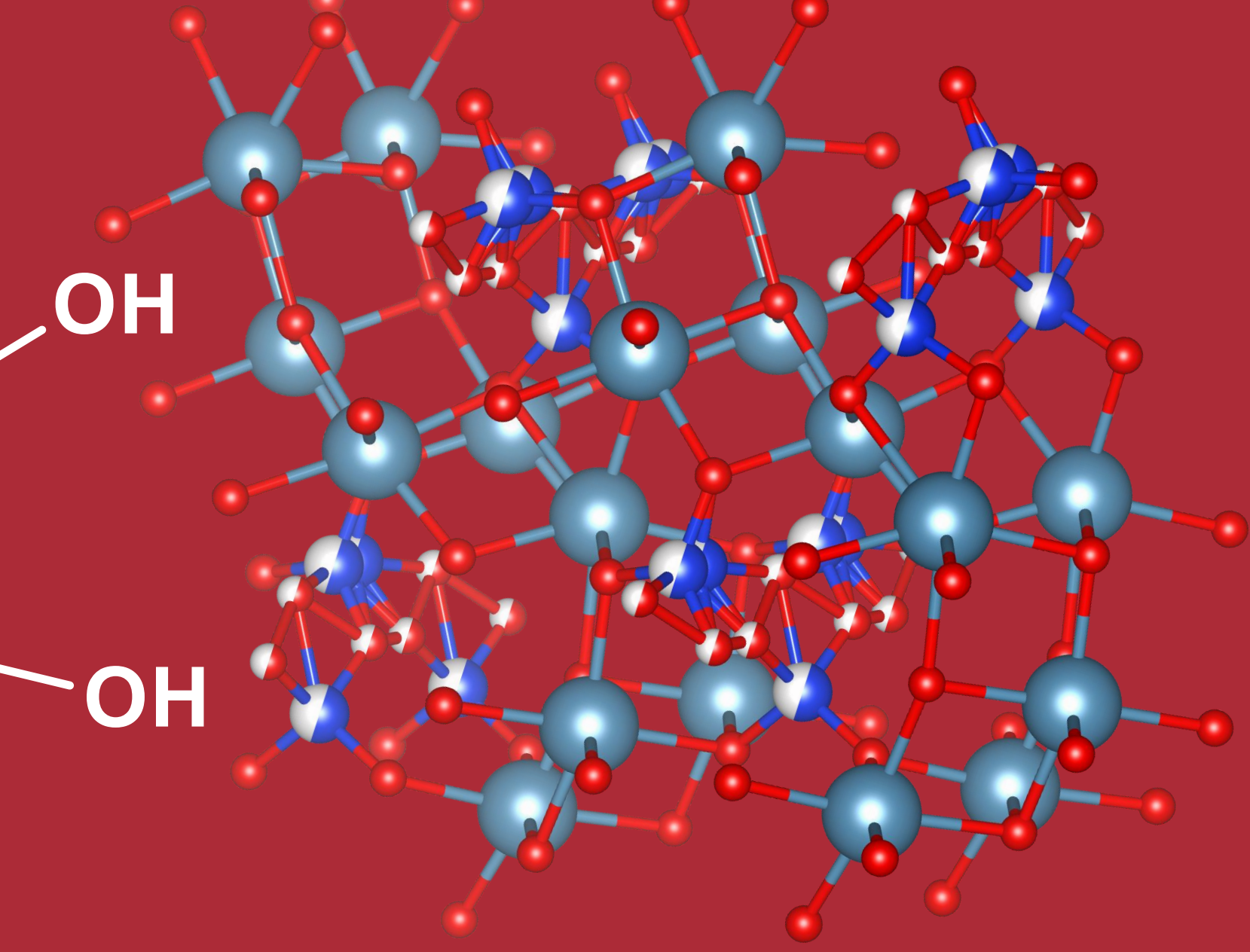
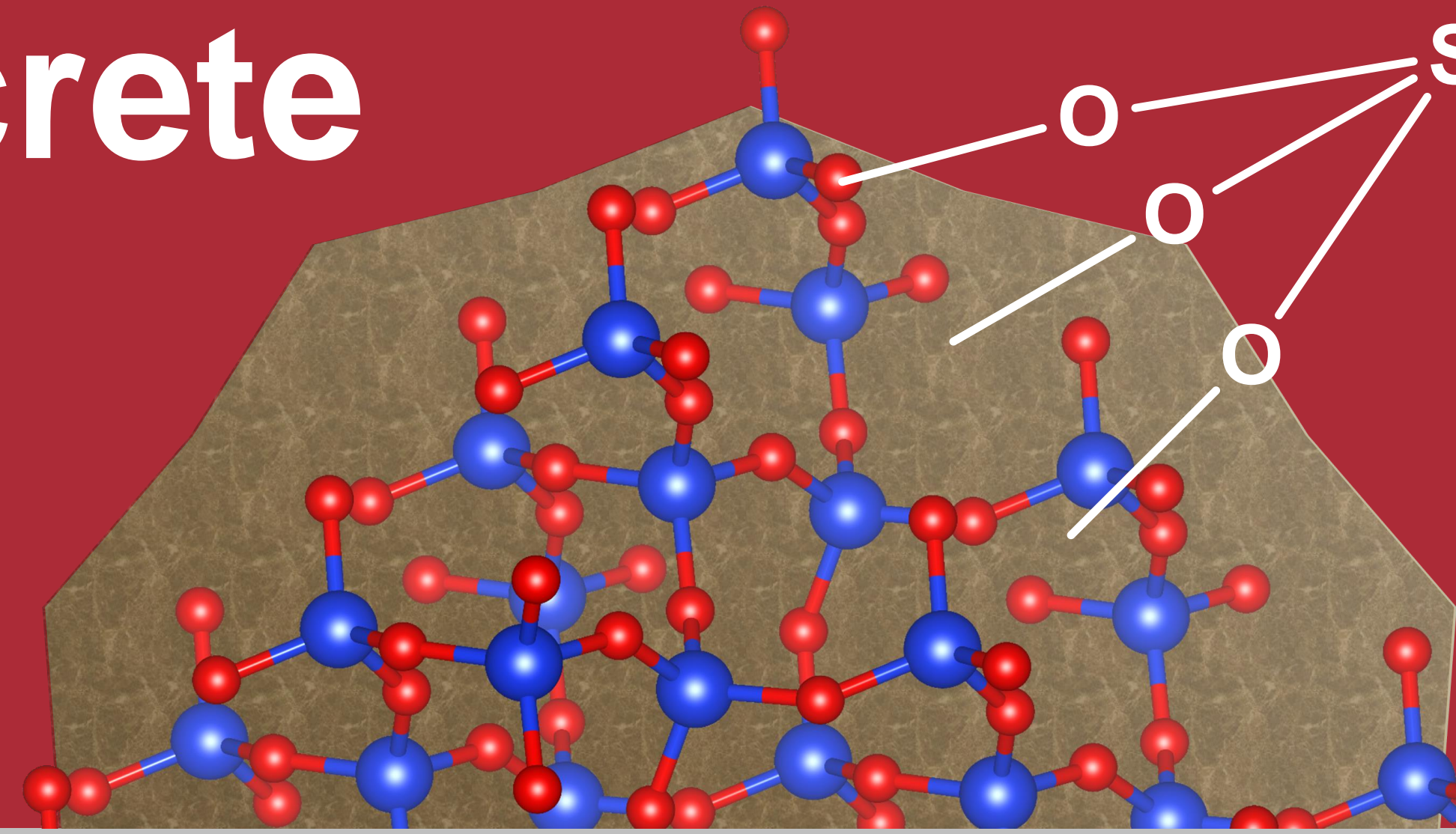
Scientific Problem: Concrete strength is limited at aggregate interfaces



Hypothesis:

Improving interfacial strength allows for less material to be used, decreasing carbon emission.

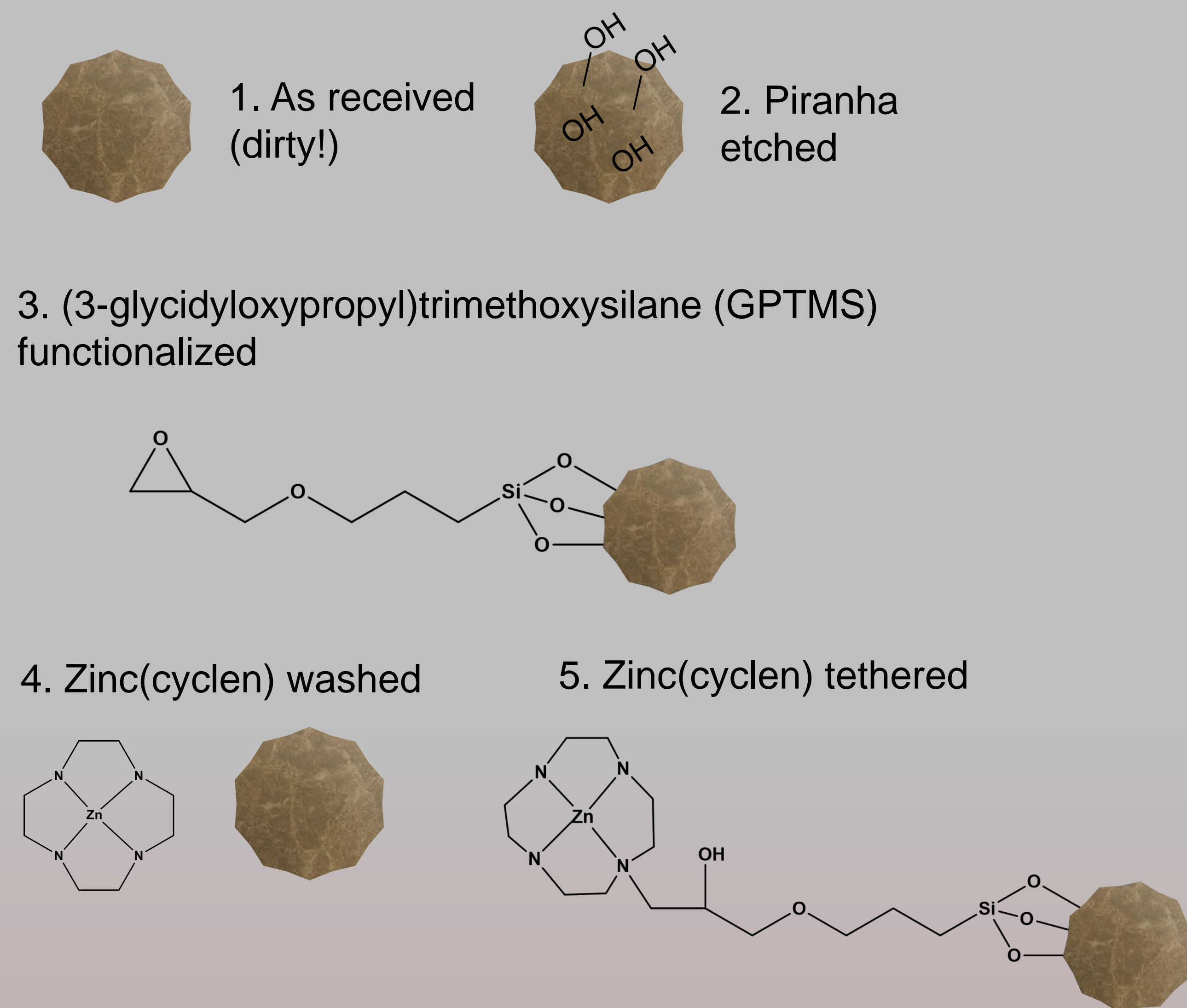
Silanes on Sand Improve Ca²⁺ Deposition and Growth for Stronger Concrete



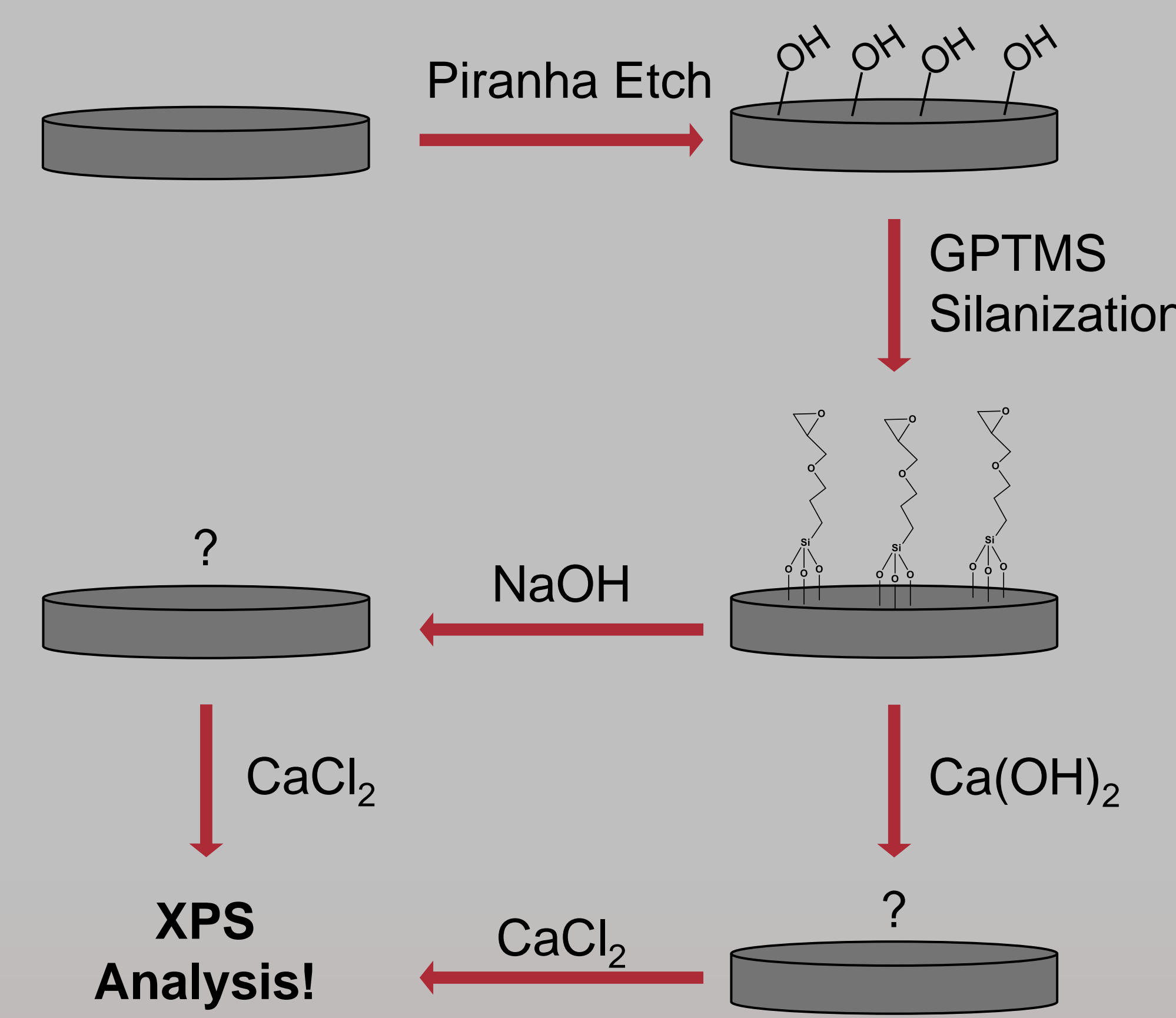
Allison L. Morin, Grimmgroup

wpi.edu/+gg WPI Department of Chemistry & Biochemistry
Rebecca J. Gilchrist, Dalton C. Vassallo, and Stephanie G. Korunow

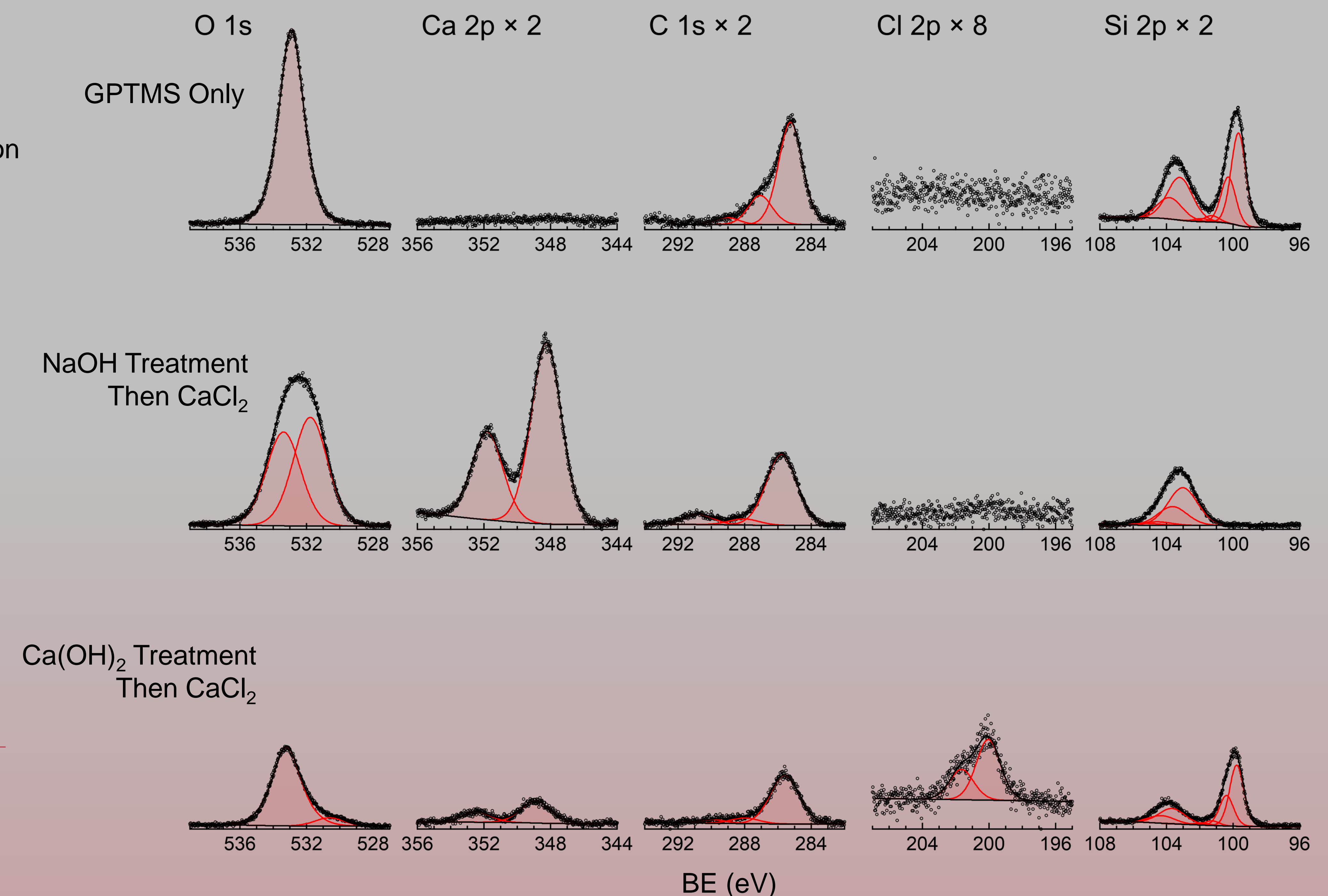
Using Silanes with Varying Chemical "Ends"



Testing Calcium Deposition

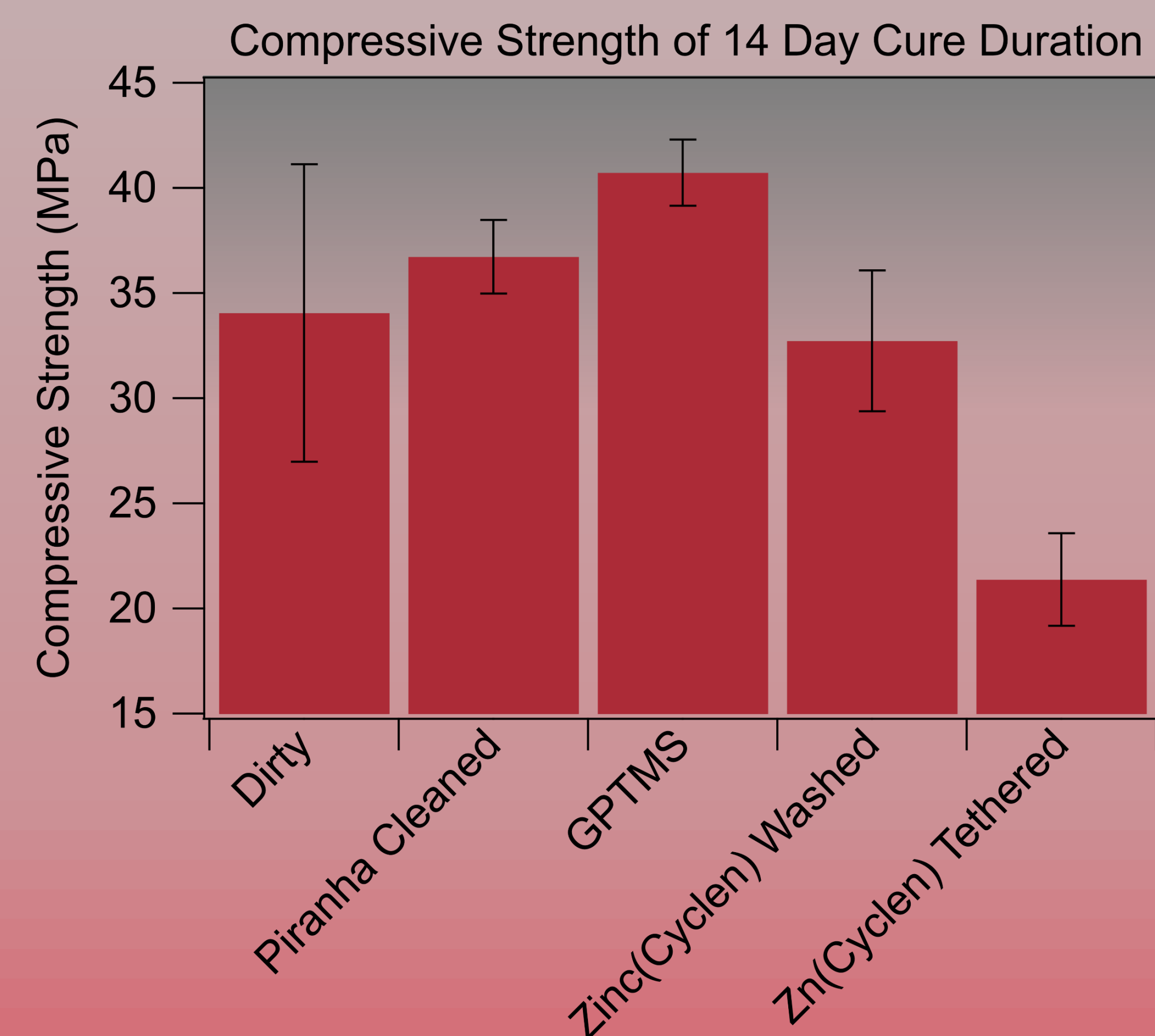


XPS: Shows Early Calcium Deposition



Photoelectron Counts

Epoxy Helps Compressive Strength



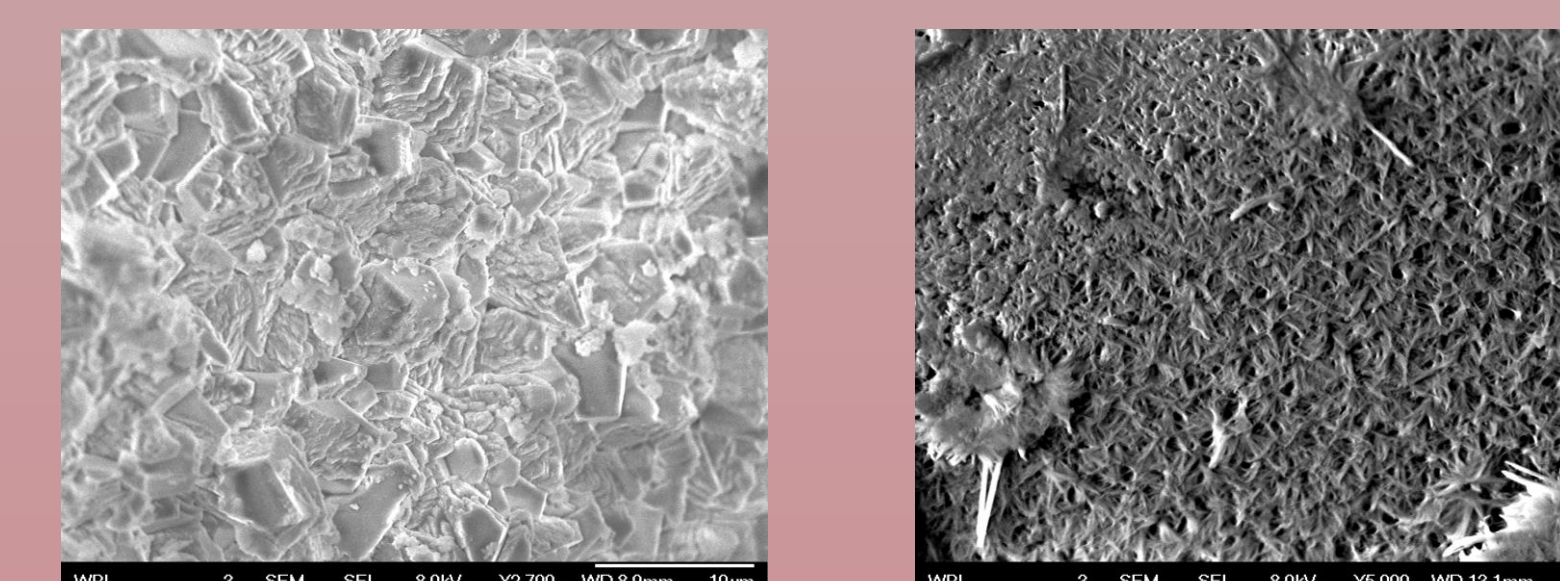
Classroom Connection

Surface Chemistry Exploration



What makes a surface hydrophobic or hydrophilic?
How can we modify a surface to change its properties?
How can we utilize certain surface properties to design real-world solutions?

Up Next!



SEM imaging of functionalized concrete structure

XRD analysis of calcium deposition

Acknowledgements

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References

(1) Joint Research, C.; Institute for, E.; Sustainability, Olivier, J.; Janssens-Maenhout, G.; Peters, J. Trends in global CO2 emissions : 2012 report; Publications Office, 2013. DOI: doi/10.2788/33777.