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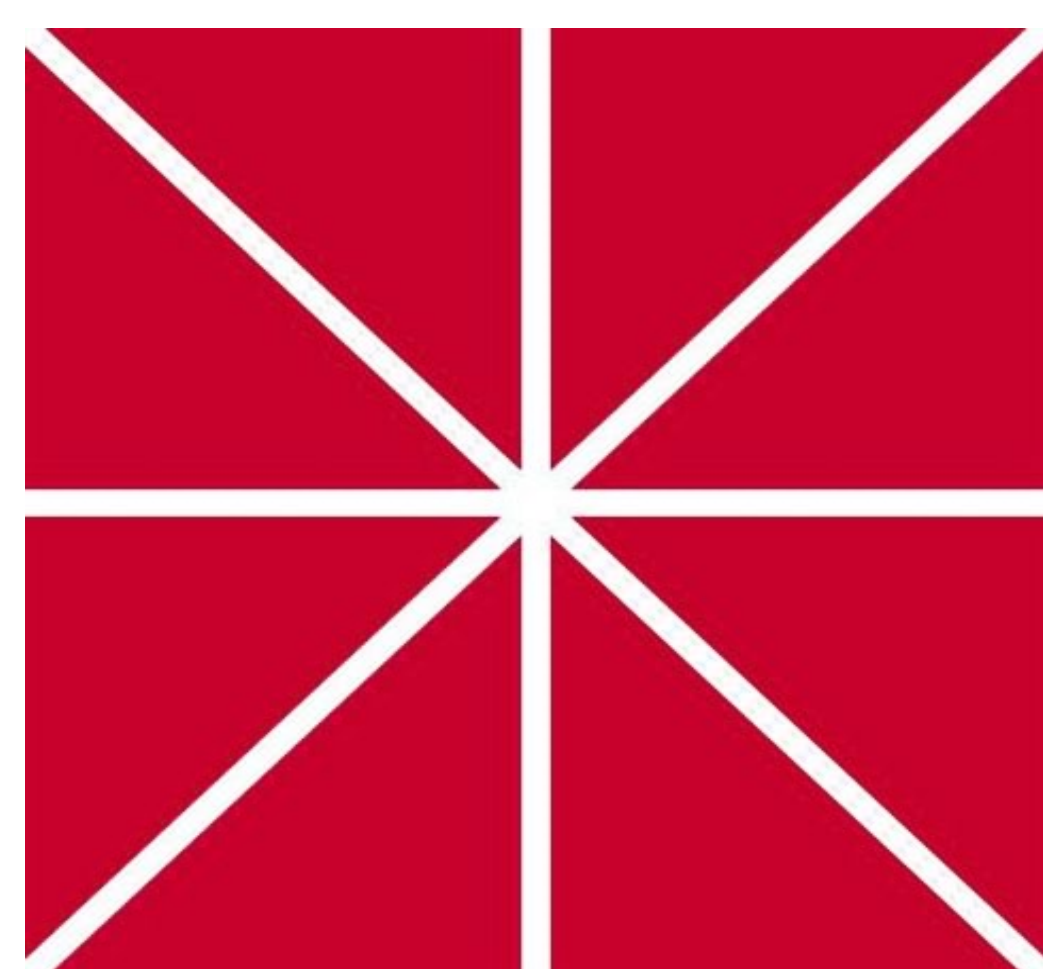
Visual Demonstration of Substituent Effects for Chromium(VI) Alcohol Oxidation

Biyu (Chelsea) Zhao

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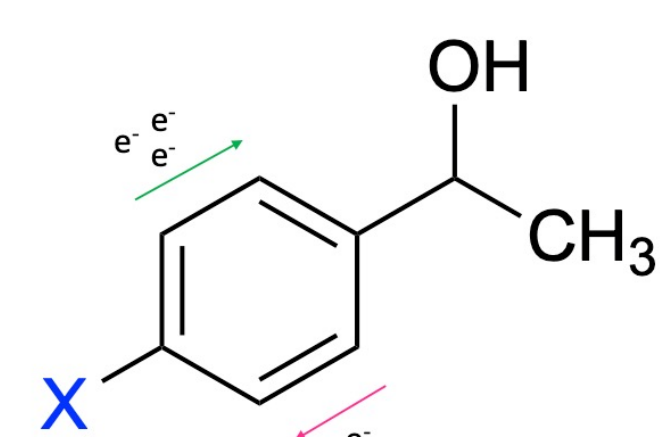


Visual Demonstration of Substituent Effects for Chromium(VI) Alcohol Oxidation

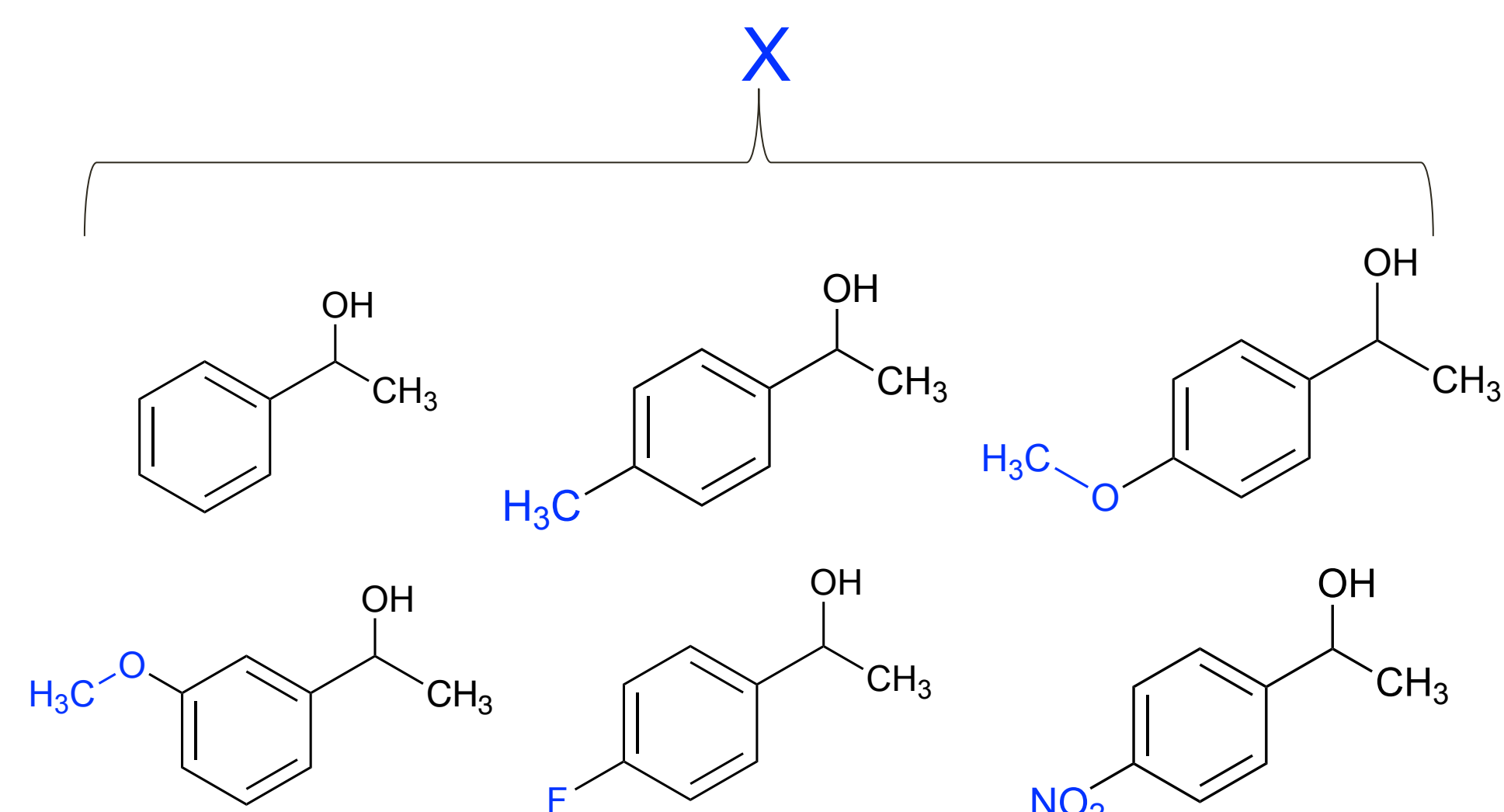
Biyu (Chelsea) Zhao and Dr. Allegra Liberman-Martin
Schmid College of Science and Technology, Chapman University

Background

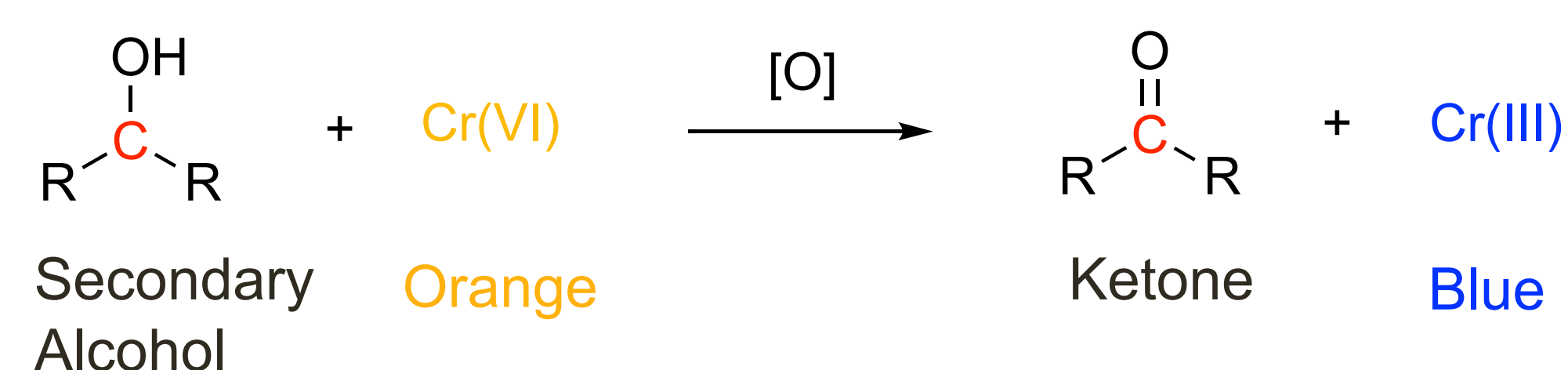
Different substituents on a benzene ring can behave as **activators** or **deactivators** and influence the rate of the reactions distinctly



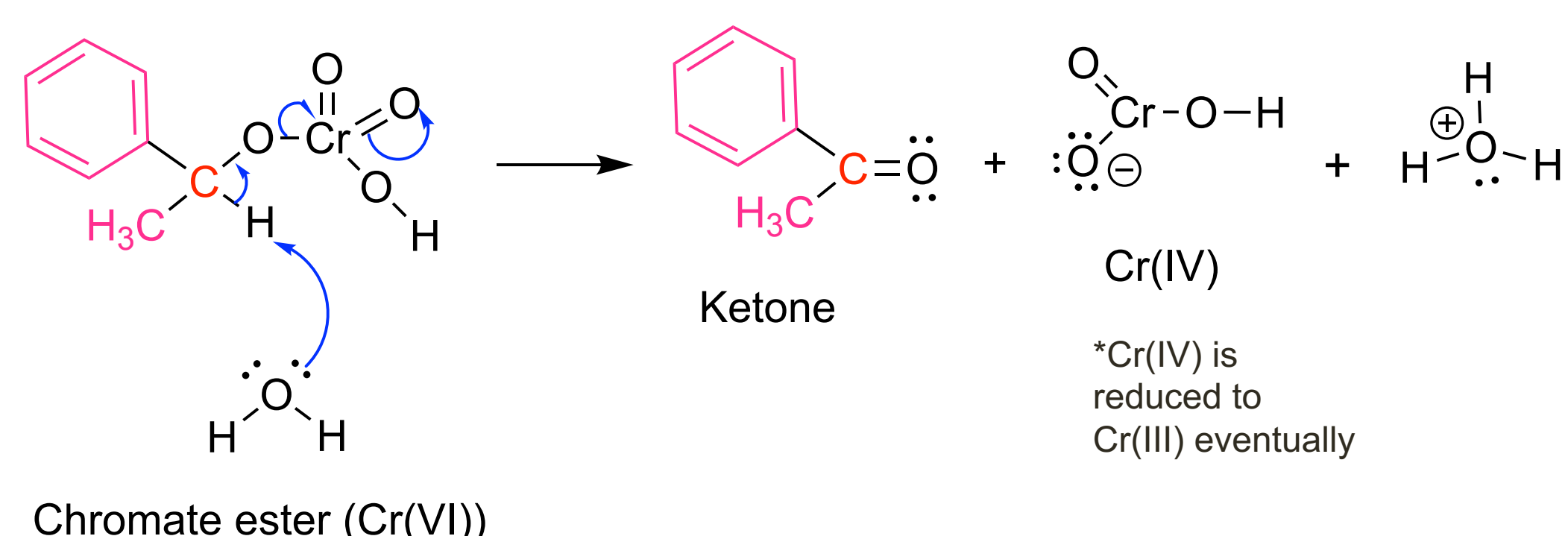
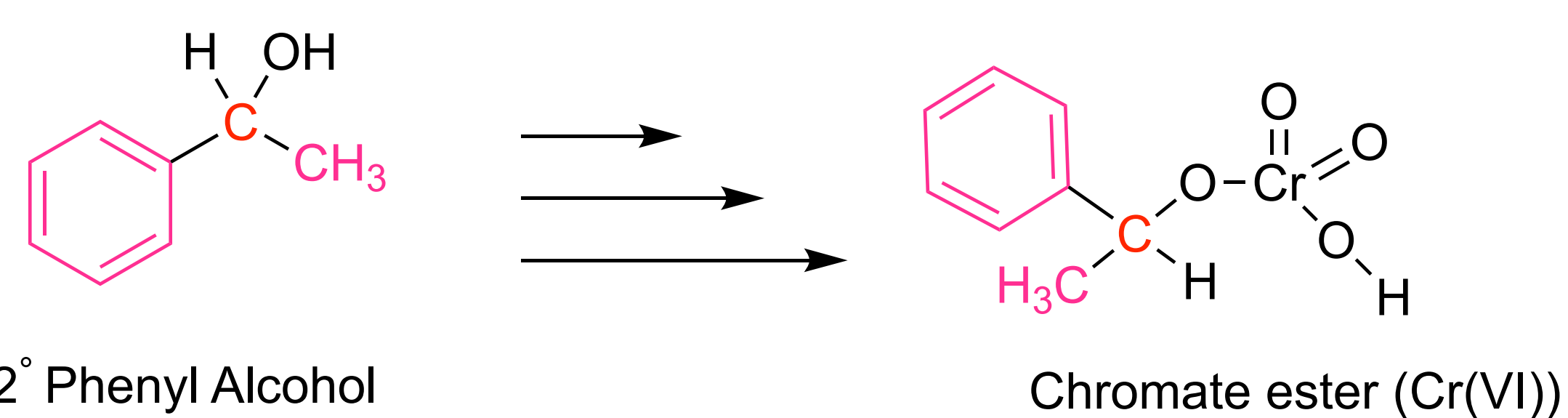
Experimental Phenyl Alcohols with Different Substituents



In oxidation of secondary alcohol with chromic acid, alcohol is oxidized, chromium is reduced



Reaction Mechanism



Visual Demonstration

Control H H₃CO NO₂

0 minute

5 minute

9 minute

30 minute

50 minute

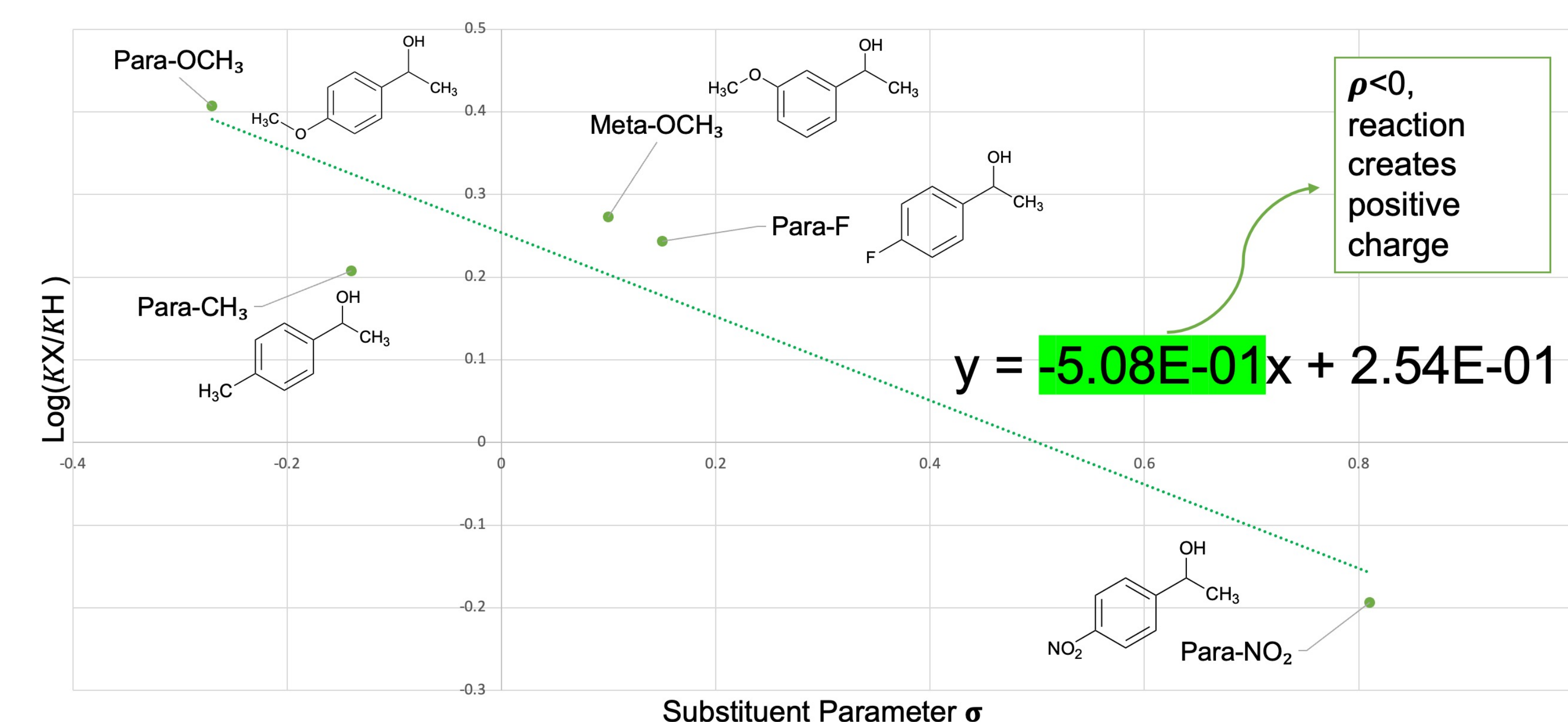
Rate Constant

Alcohol	Rate constant
	9.42E-03 ± 0.00021
	1.52E-02 ± 0.0011
	2.41E-02 ± 0.0014
	1.77E-02 ± 0.00032
	1.65E-02 ± 0.00064
	6.04E-03 ± 0.00013

Hammett Plot

Hammett Relationship: $\log\left(\frac{K_X}{K_H}\right) = \rho\sigma_X$

Hammett Plot



References

- Iskenderian-Epps, W. S., Soltis, C., & O'Leary, D. J. (2013). Visual isotope effects: Demonstrating the primary kinetic isotope effect in the chromium(vi) oxidation of 2-propanol-d8 and methanol-d4. *Journal of Chemical Education*, 90(8), 1044–1047. <https://doi.org/10.1021/ed300628n>
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