**Single Cell Chemical Imaging with Stimulated Raman Scattering for Biofuel Production Screening**

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## Project Goals:

The convergence of metabolic engineering and synthetic biology disciplines has led to increasingly efficient microbial production of valuable chemicals such as biofuels. Recent advances in genetic and protein engineering allow for more extensive strain optimization and diverse chemical production. However, state of the art screening techniques are destructive and lose single cell production data. Stimulated Raman scattering (SRS) imaging has the potential to be used as a single cell screening platform by directly detecting chemicals' Raman spectra. Here, we demonstrate the ability to differentiate production levels of several biofuels within E. coli based on unique Raman spectra footprints. Utilizing the spectral information, we showcase the ability to differentiate free fatty acids of different chain lengths, allowing for accurate enzyme specificity prediction. The results show the potential of this imaging platform to be used to guide strain optimization for metabolic engineering projects.