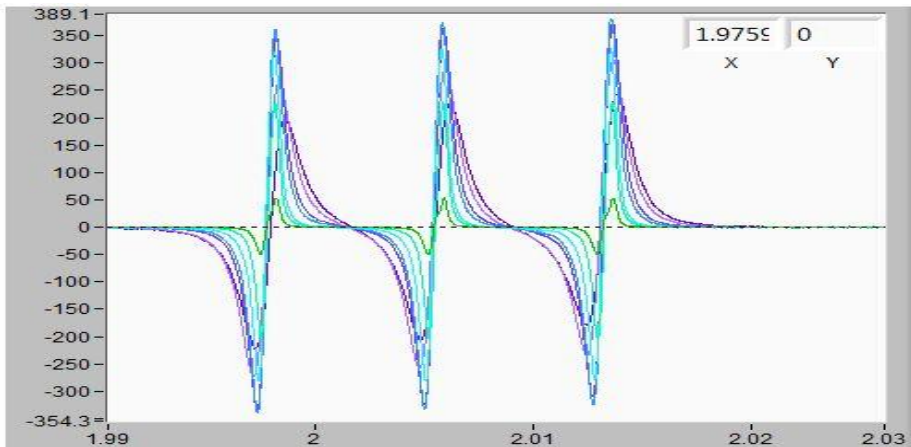


Micro-ESR Spin-Spin Exchange Experiment

Using Potassium Nitrosodisulfonate
(Fremy's Salt or PADS)



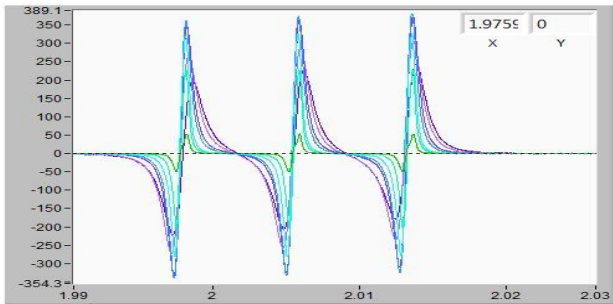
Introduction

- Electron spin-spin exchange occurs when 2 radicals in solution with opposite spins collide (the two electronic wave functions overlap)
- When the spins are exchanged, the lifetime of the state is shortened, and the lines are broadened
- The higher the concentration of radicals, the greater the chance two radicals will exchange spins, and the broader the lines.

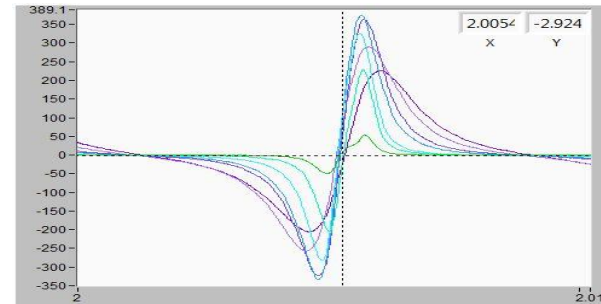
Experimental

- All solutions were made from volumetric dilutions of a 50 mM stock solution of $\text{K}_2(\text{SO}_3)_2\text{NO}$ in 50 mM K_2CO_3 solution
- The solutions were not deoxygenated
- All solutions were run in a 1.7 mm capillary positioned with an O-ring inside a 5mm quartz ESR tube
- Spectral parameters: 1 scan, 4096 points, 100 G sweep width, 6 mW RF power, and mod coil power at 10%
- “Infinite dilution” was determined with a 0.2 mM sample.

Results



All Spectra



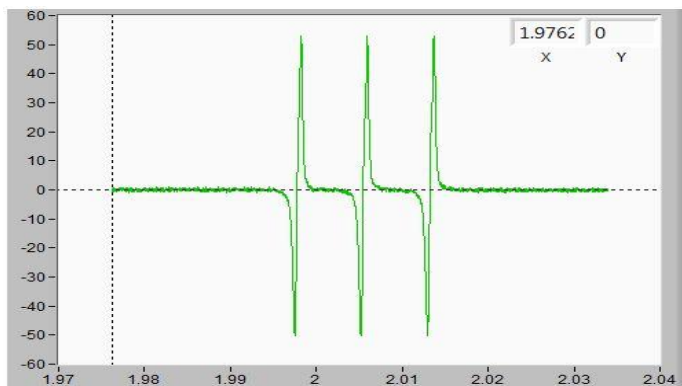
All Spectra, Center Peak Only

Concentration (mM)	Line Width (G)	Peak to Peak Amplitude
1	1.3	103
5	1.1	435
10	1.3	609
20	1.4	713
25	1.5	690
40	2.1	543
50	2.4	433

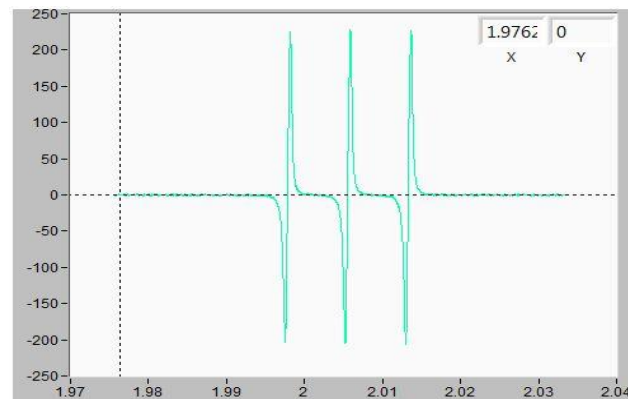
Discussion

- The 0.2 mM solution of $\text{K}_2(\text{SO}_3)_2\text{NO}$ in K_2CO_3 had a line width of 1.1 G. This was taken to be the narrowing limit. This line would be narrower if the solution had been deoxygenated.
- As the concentration of radical increased, the line width increases as the frequency of collisions increases.

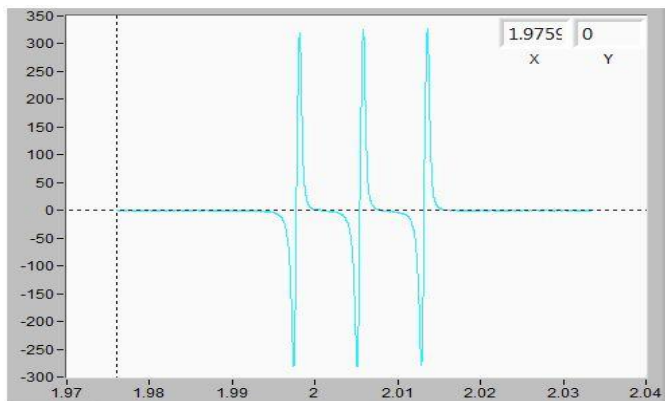
Individual Spectra



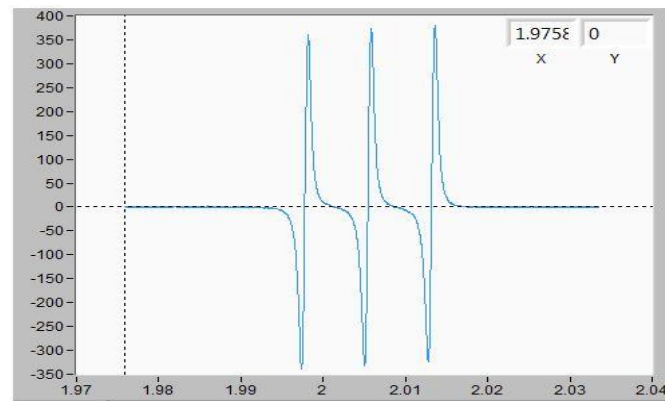
1 mM



5 mM

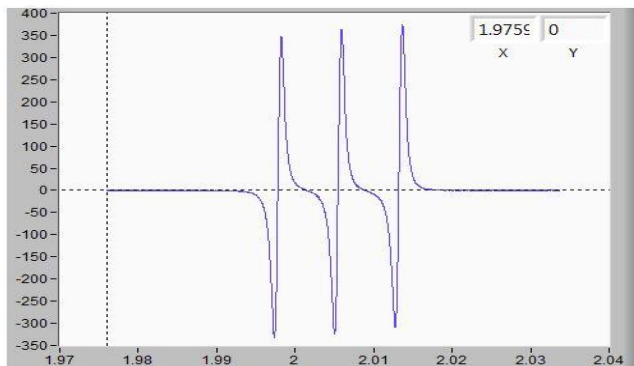


10 mM

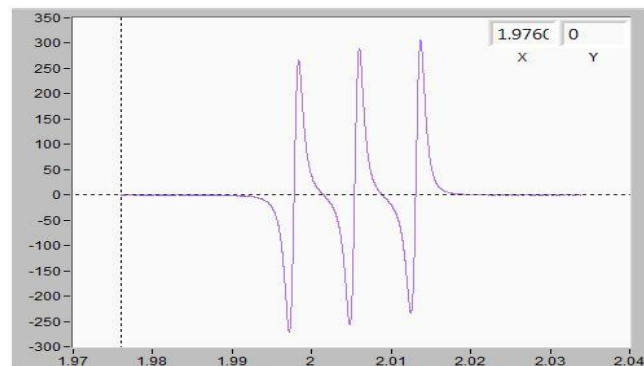


20 mM

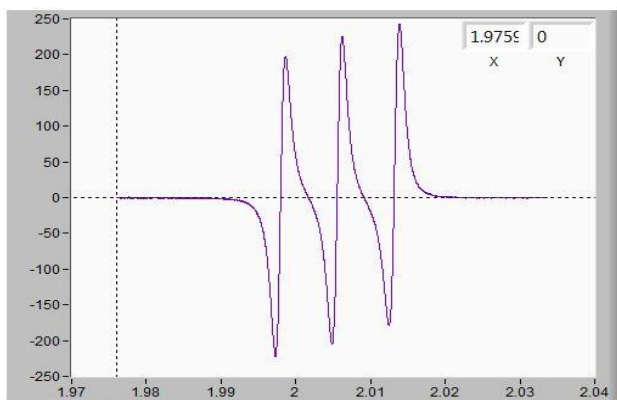
Individual Spectra (cont.)



25 mM



40 mM



50 mM