

A measurement of the complex forming reaction of nickel sulfate and Rochelle salt probed by stopped-flow CD spectroscopy

Introduction

Stopped-flow CD is a well-known method to probe the unfolding and refolding processes of proteins in order to obtain secondary structure information on a millisecond time scale. Stopped-flow CD can also be used outside the realm of protein dynamics, to observe complex-forming reactions. Transition metal complexes typically exhibit absorption bands in the visible to near-infrared region of the spectrum and CD measurements can be used to probe structural changes occurring in this region.

This application note demonstrates the measurement of the complex-forming reaction of nickel sulfate and Rochelle salt using a High Speed Stopped-Flow system consisting of a J-1500 CD spectrometer and a SFS-562T stopped-flow accessory.

Keywords

J-1500, circular dichroism, stopped-flow, SFS-562T, transition metal complexes, kinetics, infrared, visible, chemical



JASCO J-1500 CD spectrometer
View product information at www.jascoinc.com

Measurement conditions	
Measurement wavelength	1 nm
Path length	2 mm
Spectral bandwidth	5 nm and 10 nm
Data pitch	1 msec
Accumulations	75 and 50 times
Response time	2 msec
Syringe 1	0.24 M nickel sulfate
Syringe 2	0.36 M Rochelle salt
Mixing ratio	100 μ L:100 μ L
Total flow rate	5 mL/sec

Results

Figure 1 illustrates the CD spectra of 1:1 solution sample of nickel sulfate and Rochelle salt. The CD spectrum exhibits a single, broad peak from the ultraviolet (UV)-visible to near infrared (NIR) region.

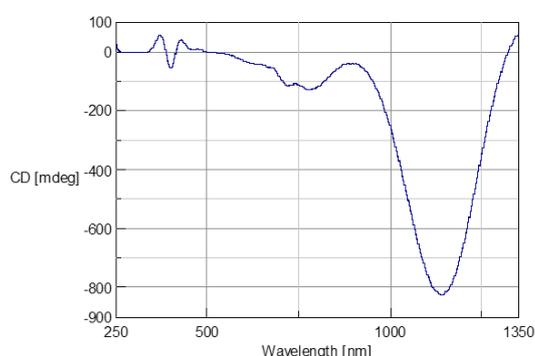


Figure 1. CD spectra of 0.24 M nickel sulfate and 0.36 M Rochelle salt in a 10 mm path length cell.

The stopped-flow CD spectra of nickel sulfate and Rochelle salt are shown in Figure 2-4. The data illustrated in Figure 2 were obtained at 720 nm and Figure 3 were obtained at 1000 nm. Figure 4 shows both the spectra obtained at 720 and 1000 nm for comparison. After 100 msec the data for both wavelengths begin to level off, indicating that the complex-forming reaction is complete. This also means that the data measured at both 720 and 1000 nm observe the same reaction process.

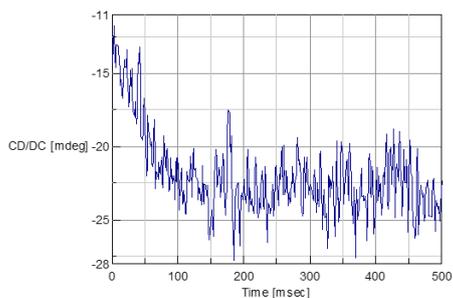


Figure 2. The complex formation of nickel sulfate and Rochelle salt as measured by stopped-flow CD at 720 nm

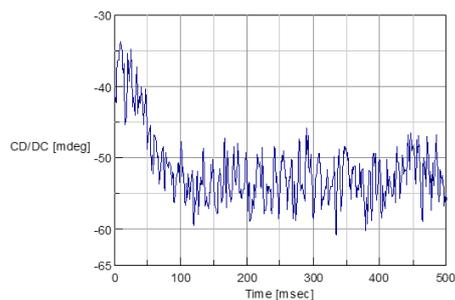


Figure 3. The complex formation of nickel sulfate and Rochelle salt as measured by stopped-flow CD at 1000 nm

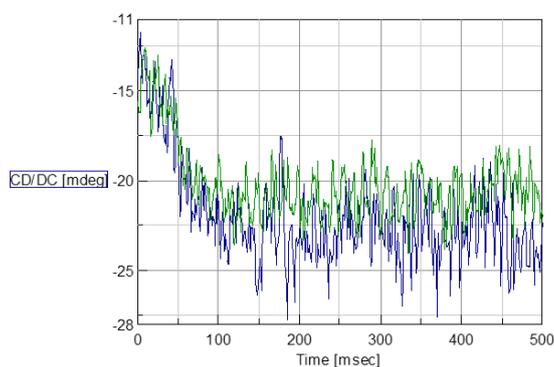


Figure 4. The complex formation of nickel sulfate and Rochelle salt as measured by stopped-flow CD at 720 nm (blue) and 1000 nm (green)

Conclusion

This application note demonstrates that the J-1500 CD spectrometer and SFS-562T stopped-flow accessory can be used to monitor complex-forming reactions and their completion time.

References

1. Miyake, H., Sugimoto, H., Tamiaki, H., and H. Tsukube, (2005) Chem. Commun., 429104293.
2. Miyake, H., Kamon, H., Ikuko, M., Sugimoto, H., and H. Tsukube, (2008), JACS, 130, 792-793.