

INVESTIGATION OF THE SPECIATION IN  
AQUEOUS POLYSULFIDE SOLUTIONS

S. A. Khan\*, R. W. Hughes\*, P. Reynolds\*, N. Ward†.

\*University of Bristol, Bristol Colloid Centre,  
Cantock's close, BS8 1TS, UK.

†Regenesys Technologies Ltd, Harwell International  
Business Centre, Harwell, OX11 0QA, UK.

Polysulfide electrolyte is a complex system with species such as  $S^{2-}$ ,  $HS^-$ ,  $OH^-$ ,  $H^+$ , and  $S_x^{2-}$  where  $x=2-5$ . The use of UV-ATR spectroscopy with a sub micrometer path length has been applied to investigate the highly concentrated sulfide and polysulfide aqueous solution at wavelengths from 200 to 500nm. By determining the precise location of  $HS^-$ ,  $OH^-$ , and  $S^{2-}$  species in the 200-230nm wavelength region, the combine absorption spectra of polysulfide solutions has been resolved. A titration method is developed to find the concentration of  $HS^-$  species in any sodium sulfide and polysulfide solution. Sulfide and polysulfide chemistry is presented in more detail by comparing the UV-ATR spectra and pH changes in the solutions. The UV-ATR absorption data has been modelled to calculate the equilibrium distribution of sulphide and polysulfide species in solution. The precise attribution of absorption spectra is a significant step forward in the speciation of the system and its use in energy storage systems

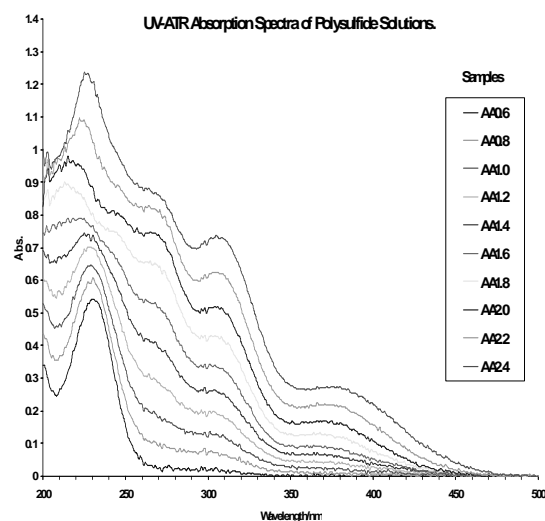


Figure 1 – UV-ATR Absorption Spectra of polysulfide solutions