

**Iterative Target Transform Factor Analysis: A  
Tool for the Deconvolution of  
Spectroelectrochemical Data Applied to the  
Redox Reactions of Conducting Polymers**

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Conducting polymers are conjugated polymers which can be doped either chemically or electrochemically leading to a large increase in the polymer conductivity, as a result of the oxidation or reduction of the polymer and incorporation of a supporting anion or cation into the polymer structure to balance this charge. The doping and undoping processes usually correspond to a distinct color change. These polymers have been a huge area of research since their discovery 20 years ago due to their many potential applications e.g. as electrochromic devices, anti-corrosion films, lightweight battery electrodes and selective membranes in biosensors. Understanding the doping processes is very important to device manufacture.

Iterative target transformation factor analysis, IT-TFA, is a powerful mathematical tool for the deconvolution of spectra with broad overlapping spectral features. This technique has been applied by us to the deconvolution of in-situ spectroelectrochemical data collected during the oxidation and reduction of various conjugated polymers. This allows the spectra of the individual polaron and bipolaron species generated during redox reactions to be identified, as well as the concentration profile of each species as a function of applied potential. This is the first time factor analysis had been applied to the redox reactions of conducting polymers.