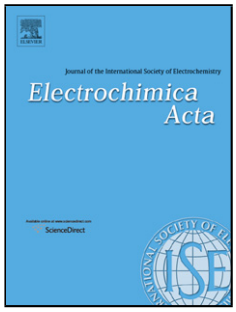

Title: In situ Raman spectroscopic studies on concentration change of electrolyte salt in a lithium ion model battery with closely faced graphite composite and $LiCoO_2$ composite electrodes by using an ultrafine microprobe

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<AT>In situ Raman spectroscopic studies on concentration change of electrolyte salt in a lithium ion model battery with closely faced graphite composite and $LiCoO_2$ composite electrodes by using an ultrafine microprobe

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<ABS-HEAD>Abstract
<ABS-P>The concentration of ions in the electrolyte solution in lithium ion batteries changes during operation, reflecting the resistance to ion migration and the positions of diffusion barriers. The change causes various negative effects on the performance of batteries. Thus, it is important to elucidate how the concentration changes during operation. In this work, the concentration change of ions in the electrolyte solution in deep narrow spaces in a realistic battery was studied by in situ ultrafine microprobe Raman spectroscopy. Graphite composite and $LiCoO_2$ composite electrodes, which are the most commonly used electrodes in practical batteries, were placed facing each other and their distance was set to 80 μm, which is close to the distance between electrodes in practical batteries. After repeated charge/discharge cycles, the concentration of ions increased and decreased greatly during charging and discharging, respectively. The maximum concentration was more than three-times higher than the minimum concentration. The rate of changes in concentration increased almost linearly with increase in current density. The results have important implications about concentration changes of ions occurring in practical batteries.

<KWD>Key words: Lithium ion battery; Solid electrolyte interphase; In situ analysis; Raman spectroscopy

<H1>1. Introduction