# Scanning electrochemical microscopy investigations of mixed graphite/silicon anodes for Lithium Ion Batteries

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Nowadays, lithium-ion batteries represent the most widely used secondary battery. They stand out because of their high energy and/or power density and play an important role in the further development of electric mobility and mobile applications (e.g. laptops, cellphones, power tools etc). Due to its low average voltage, good rate capability, low irreversible capacity, low volume expansion during lithiation causing excellent cycle life, graphite has been the material of choice as anode material. Nevertheless, the relatively low specific capacity of graphite anodes is a limiting factor for further improving the overall energy density of Lithium ion battery cells. Therefore, Silicon has turned out to be the most important alloying element because of its low cost, high energy density and hence, it has found its way into commercial cells. Despite decades of research regarding the electrochemical and structural performance of Silicon-based electrodes for Lithium ion battery cells, many issues like limited cycle life due to volume and crystallization effect keep challenging the life-time of such batteries and limit the amount of Silicon feasible in commercial cells.

In this context, we have applied Scanning Electrochemical Microscopy (SECM) to study in-situ near-surface electrochemical effects of Silicon/graphite blend electrodes. The method is used to characterize space-resolved electrical conductivity as well as to detect electrochemical active species in close vicinity of the electrode surface. In this way, clues about charging effects on electrical conductivity are monitored and plotted. Furthermore, by applying the feedback mode of the SECM, space resolved maps of the electrical conductivity of the surface were recorded. The study also focused on the homogeneity of Silicon and graphite within the anode electrode.