Effect of Clay Type on the Diffusional Properties of a Clay-Modified Electrode

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Abstract: The response of two swelling clays (SWy-1 and SAz-1) and of one non-swelling clay (KGa-1) and of a series of mixtures of these clays to different electrolyte concentrations was examined using clay-modified electrode techniques. A non-interacting probe ion, $Fe(CN)_6^{3-}$, was monitored via reduction for its arrival at a Pt electrode coated with thin films of the clay mixtures. The three clays had both different temporal responses and different equilibrium currents. For SWy-1 the currents were developed over time and were dependent upon the electrolyte of the bathing solution, which was consistent with X-ray diffraction data literature for the interlayer dimension. Similar behavior was found for SAz-1, but for KGa-1, currents were instantaneous and were independent of the bathing electrolyte. This suggests that the pores controlling the probe ion transport were between particle or pinhole in nature. When mixtures of the clays were examined, it was found that KGa-1 caused defects within the structures of the mixed clay films. The SWy-1 mixture was not as affected by these disruptions as was the SAz-1 mixture.

Key Words: Clay charge • Clay-modified electrodes • Clay swelling

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