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Comparison of fractal and CMR models to investigate ionic conductivity

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Abstract

A simple equivalent circuit to explain the electrical response of an ionic conductor is a parallel circuit consisting of an electrical resistance and a capacitor. Impedance semicircle of such a circuit is exactly a semicircle, but the impedance semicircle of experimental data is a depressed one. To explain this deformed shape of semicircle, usually CPE (constant phase element) is used in equivalent circuit instead of the capacitor. There are just a few theoretical researches about this element, which explain the deformed shape by fractals based on the surface roughness. The present work investigated the surface roughness and rejected its influence on the shape of impedance semicircle by using experimental data. An equivalent circuit is offered for ionic conductors based on the CMR “Concept of Mismatch and Relaxation” model.

Keywords: ionic conductivity, CMR, equal circuit, impedance semicircle, fractal, surface roughness

For full article, refer to the Persian section