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【212】 Investigations of polarons in hematite – $Fe_2O_3(1\bar{1}02)$ by means of nc-AFM and KMC

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Polarons strongly influence the catalytic activity of transition metal oxides. The study of polaron formation and dynamics is fundamental to understanding the actual mechanisms and yields of catalytic reactions in these materials. A new method for the investigation of electron and hole polarons is demonstrated. Charge carriers are injected with the AFM tip into natural and Ti-doped $Fe_2O_3(1\bar{1}02)$. These carriers form a cloud of trapped charges, which expands due to electrostatically and thermally activated polaron hopping. Annealing of the sample and characterization by KPFM provides information on polaron dynamics; these results are compared to KMC simulations and the dependence of the hopping activation energy on the Ti doping is shown.

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