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Quantitative analysis of spotty diffraction rings and application to corrosion studies of steel

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Spotty diffraction rings are symptomatic of large-grained polycrystalline materials. Analysis of these rings falls into a void between single crystal and powder diffraction methods, and is usually dismissed or discussed only briefly and in a qualitative fashion. Recently, we have developed statistical methods for quantitatively analysing the 'spottiness' of diffraction rings, such as those observed during CO₂ corrosion of steel in aqueous solutions under electrochemical control. These include the normalised roughness and the fractal dimension of the diffraction ring, obtained from 2D diffraction images. Statistical measures obtained for diffraction patterns calculated from theoretical crystallite size distributions are compared to those obtained for experimental data. This illustrates that the corrosion mechanism relies on the formation of surface roughness, which proceeds via preferential dissolution of small grains.

References:

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Summary

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