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Roughening Temperature of Facets in Au Electrodeposition

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A theory has been established to describe the formation of facets on metal crystals grown from their melt. There exists a temperature for each crystallographic orientation below which it will form a facet, and above which the metal surface will be rounded and atomically rough. Here we have extended this theory to electrodeposition. We used potentiostatic electrochemical impedance spectroscopy to measure the approximate surface energy of Au at different applied potentials to determine the roughening temperature for each potential. From this, we grew different nanostructures with different proportions of facets and tested them as electrocatalysts for CO_2 reduction.