

**ACTIVITY DESCRIPTORS FOR CO₂
ELECTROREDUCTION TO METHANE ON
TRANSITION-METAL CATALYSTS**

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An analysis is presented which allows an understanding of trends in the effectiveness of transition metal catalysts in the electrochemical reduction of CO₂ to methane. The analysis, which is based on an extensive set of density functional theory calculations, single out the most important catalyst properties and introduce the activity “volcano” for electrochemical CO₂ reduction. The experimentally observed variations in catalytic activity are explained including why copper is the best known metal catalyst, and why it has a prohibitively large overpotential of 1 V. The analysis also points to new strategies for the discovery of catalysts with a reduced overpotential.