

Electrocatalysis Processes and Electrocatalysts Design



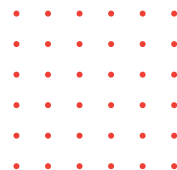
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Atanasov's group studies electrocatalysis for energy conversion and chemical synthesis and designs electrocatalysts as enabling technology for acceleration of the critical reactions in these processes. These include converting electricity into chemical form via chemicals and fuels that could supplant fossil hydrocarbons in net-zero emissions energy systems. This also includes carbon dioxide capture, conversion and valorization, water desalination, wastewater treatment and reuse.

Current effort in the development of electrocatalytic materials is in selective conversion of N_2 from air into ammonia and fertilizers by low-temperature and low-pressure electrochemical methods. Direct electrocatalytic oxidation of N_2 to nitric acid is the gateway process in this direction. It is being followed by reduction of ammonia and thus presents a strategy towards and electrochemical Haber-Bosch process. Atanasov's group also designs catalysts that co-reduce nitrates and CO_2 to directly yield urea – the major stock for fertilizer production.