Investigator: Li Tan
Position Title: Associate Professor
Department: Mechanical and Materials Engineering

Email: ltan4@unl.edu

Phone: (402) 472-4018
Webpage: https://engineering.unl.edu/mme/li-tan/

Low Temperature Titanium Extraction from Low-Cost Pigments (TiO2)

Abstract.

The *high energy expense issue* in titanium extraction from low-cost pigments (rutile TiO2) will be addressed. Popular arguments cited the large bandgap from TiO2 as the major barrier. None has ever proposed a galvanic cell as a minimal-energy-consumption alternative (□G < 0) to replace the conventional electrolysis (unfavorable reaction; □G > 0). Neither has anyone exhausted ways to lower the energy barrier at the triple interface (electrode-TiO2-electrolyte) to accelerate the redox rate.

A combined electrochemistry, materials engineering, computational modeling, and Raman spectroscopy team to explore a novel galvanic approach for Ti extraction is proposed. Three research objectives are formulated in this 2-yr project and they are to: 1) evaluate how charge transfer at the triple interface of electrode-TiO2-electrolyte is promoted in a galvanic cell utilizing a liquid cathode; 2) engineer the bandgap in rutile TiO2; and 3) capture the reaction intermediates along the triple interface by performing *in situ* Raman spectroscopy.