# Ultra-deep catalytic adsorptive desulfurization of diesel fuel using Ti-silica gel adsorbent at low Ti-loading

Lei Dong[1], Xiong Dai[1], Chong Peng[2], Cuiting Yang[1], Shibin Chen[1], Guang Miao[1], and Jing Xiao[1]

[1]South China University of Technology
[2]Fushun Research Institute of Petroleum and Petrochemicals

April 05, 2024

## Abstract

In this work, the effective ultra-deep catalytic adsorptive desulfurization (CADS) using Ti-silica gel adsorbent at low Ti loading range (< 1%) was investigated. The superior CADS capacity (37.3 mg-S/g-A) and high TOF value (432 h-1) for dibenzothiophene (DBT) were achieved at 0.6% of Ti loading with high dispersion and low Ti coordination. The catalytic oxidation of DBT conformed to the pseudo-first-order kinetic model, and the corresponding rate equation was well described as rDBT=[(N^2)*k/(K*[CHP])]*[DBT], where the TiOOR is determined as the intermediate to enable the DBT oxidation to the corresponding sulfone (DBTO2). The effectiveness of CADS using Ti-SG was verified in various real low-sulfur diesels with varied sulfur concentrations and O/S ratios in the dynamic fixed-bed adsorption and multi-cycle regenerations. This work provides insights on using low-cost bifunctional catalytic adsorbents at low Ti loading for effective CADS to realize ultra-deep desulfurization of transportation fuels.

## Hosted file

`Manuscript.docx` available at https://authorea.com/users/412161/articles/709272-ultra-deep-catalytic-adsorptive-desulfurization-of-diesel-fuel-using-ti-silica-gel-adsorbent-at-low-ti-loading