

Highlights

- ❖ A new Synthetic Nano-Catalyst is designed for ADS process.
- ❖ Ultrasonic method is used for improving fuel quality by adsorption desulfurization process.
- ❖ New active materials (KMnO_4) and ($\text{KPO}_4 \cdot 3\text{H}_2\text{O}$) are used to improve the AC based catalysts.
- ❖ The performance of the adsorbent is improved via adding carboxyl and hydroxyl groups on the surface of the adsorbent (AC).
- ❖ The adsorption kinetic parameters of ADS are determined based on experiments.