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## Efficient Separation of Phenol from Oil by Acid-base Complexing Adsorption

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**ABSTRACT:** Separation of phenolic compounds from coal tar oil has good commercial value. In this paper, we tried to use the H-bonding or Lewis acid-base interaction to chemically adsorb phenolic compounds that were both Brønsted acid and Lewis base. Hexamethylenetetramine (HMT), 1,2,4-triazole, and  $\text{AlCl}_3$  were selected as sorbents, and their adsorptive behavior were studied experimentally and theoretically. These sorbents can adsorb phenol from n-hexane oil. HMT showed the amazing phenol adsorbance ( $Q_{e,\max} > 3500 \text{ mg/g}$ ), non-corrosiveness, stable physical state, good recycling, and oil-insoluble merit. In contrast,  $\text{AlCl}_3$  was unrecoverable and triazole was partially oil-soluble, and thus they were not as good as HMT. Further, naphthalene or benzothiophene hardly hinders phenol adsorption on HMT ( $Q_{e,\max} > 3400 \text{ mg/g}$  in 5 wt% benzothiophene or naphthalene oil); whereas, quinoline interfered with the adsorption ( $Q_{e,\max} > 970 \text{ mg/g}$  in 5 wt% quinoline oil). Therefore, HMT might be an excellent sorbent for phenol, showing the best capacity heretofore.

**Keywords:** phenol; complexation; H-bonding; Lewis acid-base interaction; coal tar oil

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