Factors Affecting Adsorption

The most important factors affecting adsorption are:

- Surface area of adsorbent. Larger sizes imply a greater adsorption capacity.
- Particle size of adsorbent. Smaller particle sizes reduce internal diffusional and mass transfer limitation to the penetration of the adsorbate inside the adsorbent (i.e., equilibrium is more easily achieved and nearly full adsorption capability can be attained). However, wastewater drop across columns packed with powdered material is too high for use of this material in packed beds. Addition of powdered adsorbent must be followed by their removal.
- Contact time or residence time. The longer the time the more complete the adsorption will be. However, the equipment will be larger.
- Solubility of solute (adsorbate) in liquid (wastewater). Substances slightly soluble in water will be more easily removed from water (i.e., adsorbed) than substances with high solubility. Also, non-polar substances will be more easily removed than polar substances since the latter have a greater affinity for water.
- Affinity of the solute for the adsorbent (carbon). The surface of activated carbon is only slightly polar. Hence non-polar substances will be more easily picked up by the carbon than polar ones.
- Number of carbon atoms. For substances in the same homologous series a larger number of carbon atoms is generally associated with a lower polarity and hence a greater potential for being adsorbed (e.g., the degree of adsorption increases in the sequence formic-acetic-propionic-butyric acid).

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