



# Investigation of Activated Carbon Filtering Distillation System

Alvin Ng and Dr. Birce Dikici (Advisor)

Mechanical Engineering Department, Embry-Riddle Aeronautical University

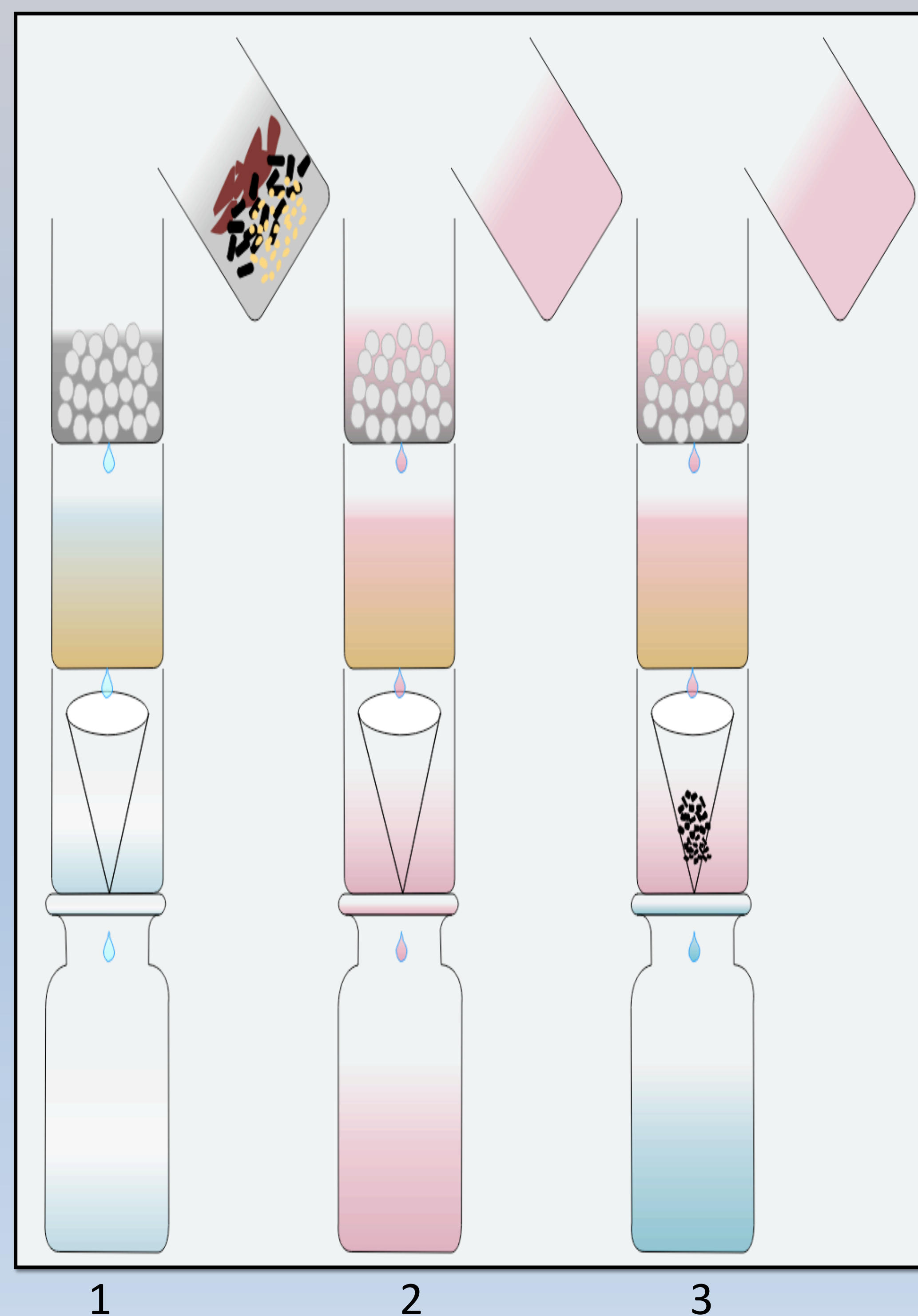


## OBJECTIVE:

Activated carbon is often used in water filtration systems. The purpose of this research is to determine the effectiveness of activated carbon and the factors that affect the performance.

## INTRODUCTION:

Activated carbon removes organic constituents by chemically adsorbing contaminants through its pores. It also improves the taste and minimizes health hazards found in water supplies such as chlorine, lead and radon which are metals and radioactive substance harmful to the human body.

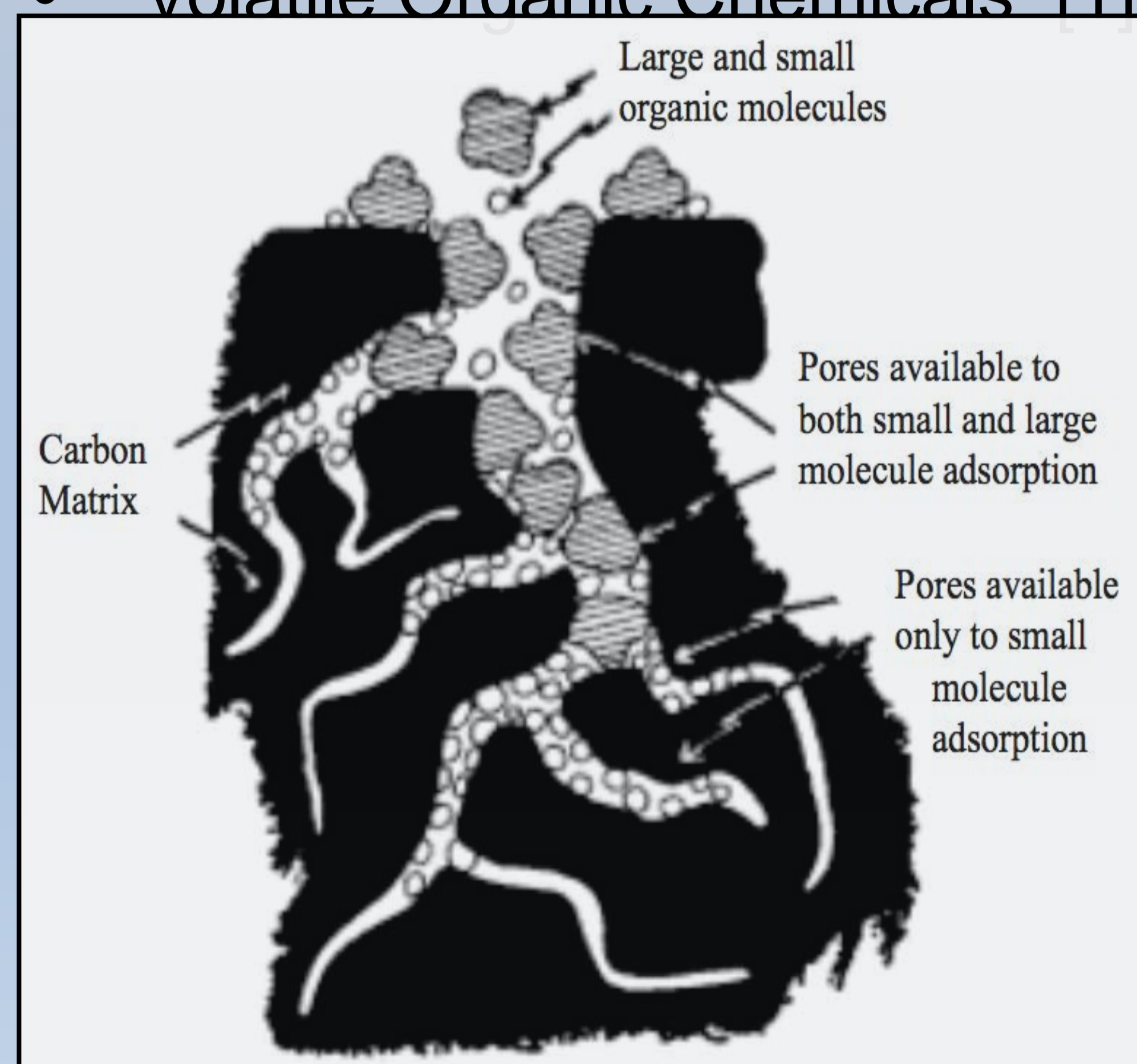


## Experiments:

Experiment	Layers	Sample	Observation
1	Pebbles, sand and filter paper	Dirty Water	Clear water
2	Pebbles, sand and filter paper	Colored water	Colored Water
3	Pebbles, sand, filter paper, and activated carbon	Colored water	Clear water

## Effectiveness of Activated Carbon in Removing Harmful Contaminants :

- Bacteria and Viruses
- Cysts (Cryptosporidium)
- Chlorine
- Color and Odor
- Lead
- Organic Chemicals
- Petroleum and Gasoline
- Radon (causes lung cancer)
- Volatile Organic Chemicals [1]



Adsorptive process where contaminants are filtered and withheld in the pores

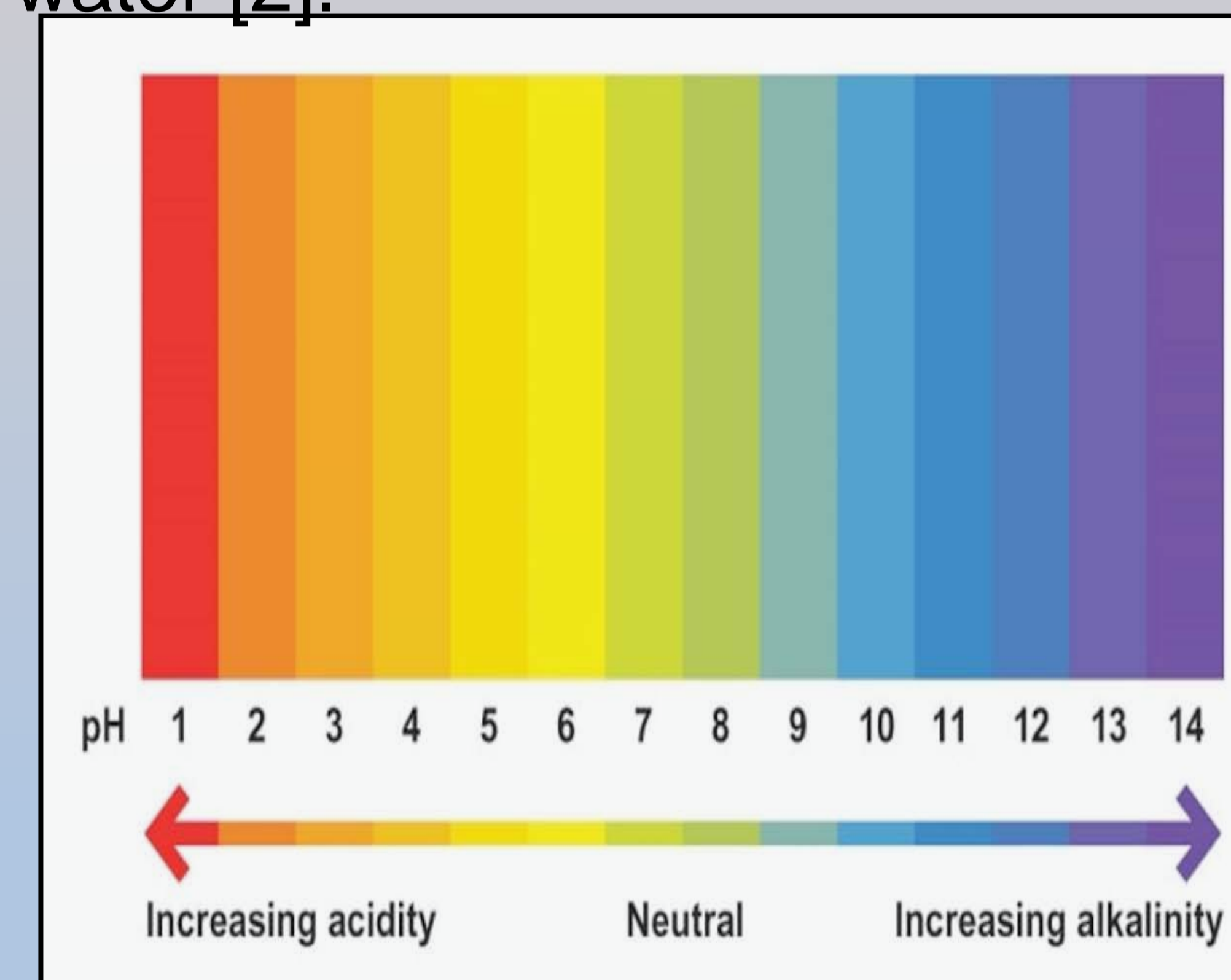
## Factors that Affect the Performance of Activated Carbon:



Powdered activated carbon

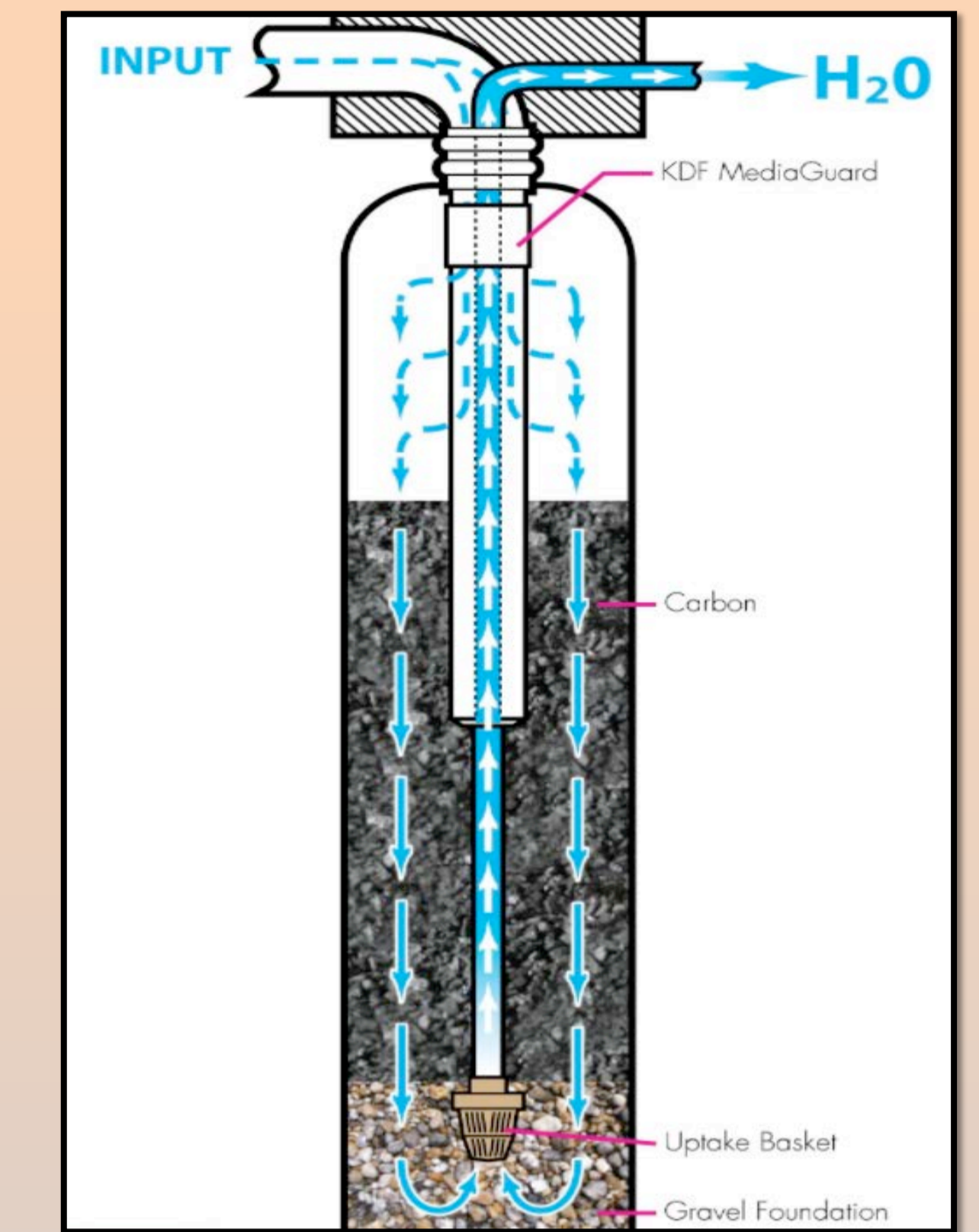
### • Molecular Weight

- As the molecular weight increases, the activated carbon adsorbs more effectively because the molecules are less soluble in water [2].



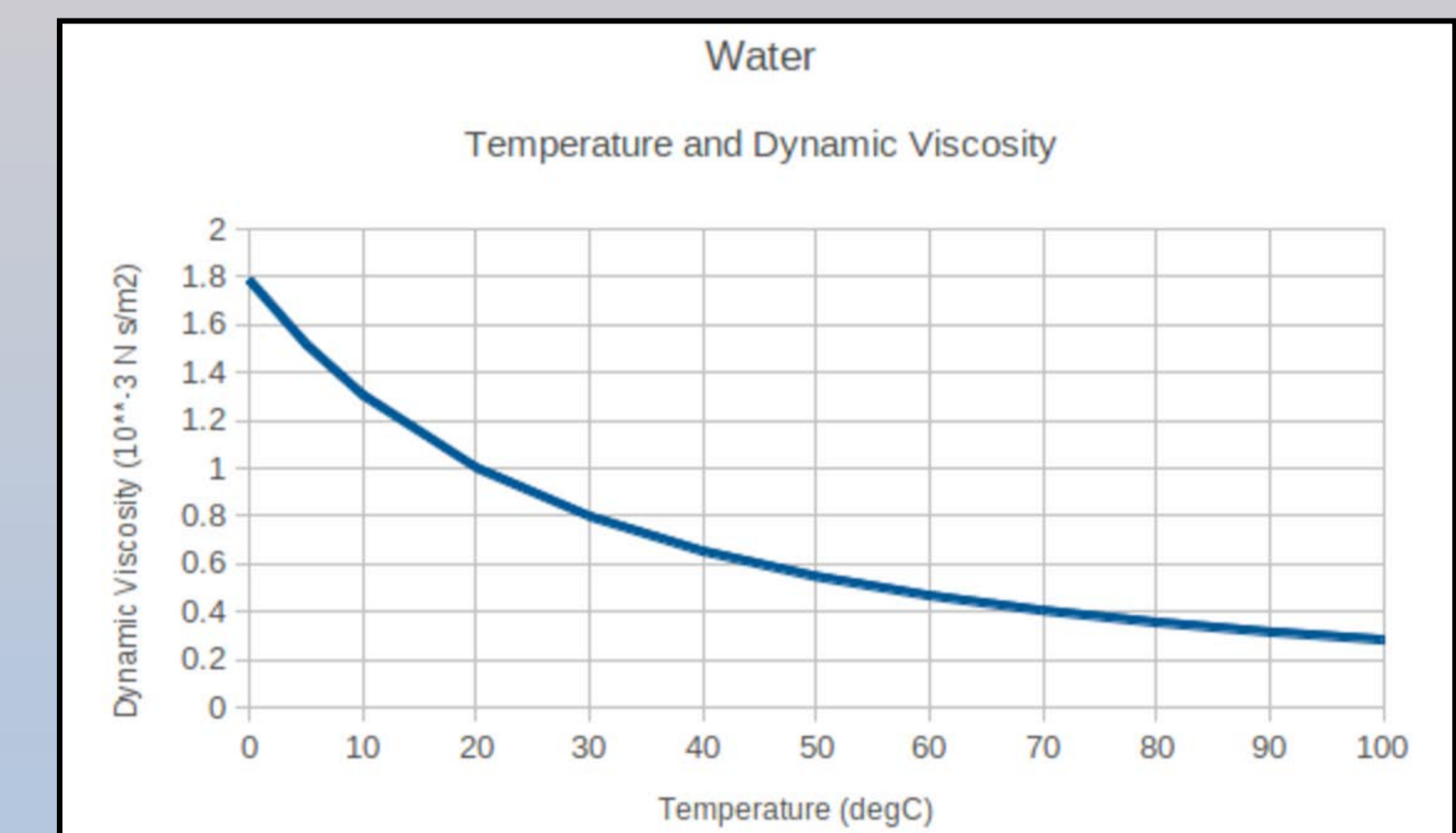
### • pH value

- At lower pH values, organics are less soluble and will be easily adsorbed by activated carbon.  
 - The size of carbon is increased by 20% for every pH unit above neutral pH (7.0) to increase adsorption [2].



### • Flow rate

- The lower the flow rate, contaminants have more time to diffuse into pores and be adsorbed. At high flow rates using finer mesh carbon filtering will cause an increased pressure drop.



### • Temperature

- As temperature increases, the viscosity ( $\mu$ ) decreases. This can increase the diffusion rate.  
 - However, higher temperatures can disrupt the adsorptive bond and decrease adsorption. Therefore, it depends the organic compound being removed [2].

### REFERENCES:

- [1] Lemley, Ann, Linda Wagenet, and Barbera Kneen. "Activated Carbon Treatment of Drinking Water." *Activated Carbon*. Cornell University Cooperative Extension, 3 Dec. 1995. Web. 1 Apr. 2017.
- [2] DeSilva, Frank. "Activated Carbon Filtration." *Activated Carbon Filtration*. Water Quality Products Magazine, Jan. 2000. Web. 1 Apr. 2017.