1 Introduction

Estrogen (E1), 17β-estradiol (E2) and 17α-ethinylestradiol (EE2) are Endocrine disrupting chemicals (EDCs) which are low levels in aquatic ecosystems but could influence human health under low dosage. Mainly source of E1, E2 and EE2 comes from the effluent of water treatment especially the secondary treatment process[1]. In order to eliminate low-concentration E1, E2 and EE2 from water, high-efficiency technologies need to be applied. This project focuses on the degradation of estrogens by ultraviolet (UV) photolysis and adsorption of activated carbon (AC) systems. Combining these two methods together to chase better treatment effect.

2 Aims and Objectives

• Explore the efficiency of UV photolysis and granular activated carbon (GAC) adsorption of E1, E2 and EE2.
• Combine two methods together to explore optimum results.

3 Methodologies

- **Mixture** (10/50/100/200µg/l) E1, E2 and EE2

4 Results

4.1 UVC Photolysis

- **Time** Range: 10 min-1 h.
- **Trend**: Increases rapidly from 10 min to 30 min. Fluctuates from 30 min to 1 h.
- **Ratio**: E1=E2>EE2 nearly 35%. E1(6.54µg/l), E2(6.67µg/l) and EE2(6.23µg/l).

4.2 GAC Adsorption

- **Time** Range: 1 h.
- **Concentrations**: 1/10/50/100/200µg/l.
- **Trend**: High concentrations have better and steady photodegradation results.

4.3 UVC Photolysis-GAC Adsorption Set

- **Time** Range: 30 min.
- **Concentrations**: 1/10/50/100/200µg/l.
- **Trend**: 50µg/l and 100µg/l have better adsorption results.

4.4 UVC Photolysis under 10 µg/l

- **Time** Range: 1 h.
- **Trend**: Decreased through time increasing.
- **Ratio**: E1(90%) > E2(50%) > EE2(50%).

4.5 GAC Adsorption under 10 µg/l

- **Time** Range: 30 min.

5 Conclusions

- UVC photolysis could reduce estrogens obviously within 1h reaction. The removal ratio of E1 is better than E2 and EE2.
- GAC absorption removed large amount of estrogens within 1 h. The removal ratios of E1 and E2 are better than EE2.
- 30 min photolysis degradation + 30 min GAC adsorption could achieve better results than 1 h GAC adsorption. E1, E2 and EE2 have similar removal ratios over 98%.

References


*GAC adsorption data for 1h EE2 lower than that under 30min combination result was also influenced by limitations due to test on two unstable LC-MS systems.