Antimicrobial resistance, where bacteria that possess a tolerance for certain antibiotics are able to proliferate, is a rapidly growing concern in the world. In Europe alone, there is an estimated 25,000 deaths per year due to resistant bacteria[1]. The prevalence of broad spectrum antibiotics for treating infections means there is a significant concentration in our water systems. While most developed countries have reliable filtration systems and regulations, there still exists industrial regions where the filtration system is not suitable for the level of contamination present [2]. Developing a fast, low cost and reliable system for the detection of these drugs would allow for the identification of problem areas to target improved filtration and treatment of wastewater. The presented work demonstrates a molecularly imprinted polymer (MIP) that contains a fluorescent moiety capable of interacting with antibiotic drugs such as nafcillin and amoxicillin. MIPs act as a synthetic receptor for a specific target, similar to antibodies, through interactions between the functional groups in the monomer and the chosen target molecule. Size-specific cavities are formed during polymerization and after the target has been extracted from the resulting material, specific rebinding can occur. Upon rebinding, the target can increase the thermal resistance of the material or interact with fluorescent molecule covalently attached to the polymer. Three different fluorescent moieties were investigated, each with different chemical structures and fluorescent bands. Fluorescent polymer microparticles were first synthesized and showed comparable binding to the target as non-fluorescent ones, demonstrating that the introduced moieties did not impede imprinting. Batch rebinding was conducted for both antibiotic drugs and the imprinted polymers showed significant higher uptake compared to the non-imprinted analogues. Fluorescence was then introduced into thin film polymers, with thickness of ~1-2 um, anchored to glass. The imprinted films showed a significant increase in fluorescent response in the presence of nafcillin compared to the non-imprinted film. The fluorescent response of 9-vinylanthracene, fluorescein methacrylate and a synthesized molecule containing multiple anthracenes were compared for each target, with and without imprinting. The measured response was used in tandem with a novel thermal detection method to quantify the level of antibiotics in aqueous samples. These results demonstrate a possible avenue to create low-cost, robust sensors capable of selectively detecting drugs in wastewater with the use of multiple transducers.

[1] Paphitou, N. I. Antimicrobial Resistance: Action to Combat the Rising Microbial Challenges. *Int. J. Antimicrob. Agents* **2013**, *42*, S25–S28.
[2] Bouki, C.; Venieri, D.; Diamadopoulos, E. Detection and Fate of Antibiotic Resistant Bacteria in Wastewater Treatment Plants: A Review. *Ecotoxicol. Environ. Saf.* **2013**, *91*, 1–9.