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MASTER THESIS PROJECT

NEW METHODS BASED ON MAGNETIC NANO-SORBENTS FOR THE DETERMINATION OF POLLUTANTS

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ABSTRACT

The excessive use of antibiotics since their discovery has led to environmental problems due to their presence as residues in environmental matrices. Certain antibiotics can bioaccumulate at different levels of the food chain, leading to adverse effects on biodiversity and human health by promoting the selection and dissemination of resistance genes in different environmental compartments. Therefore, it is crucial to develop analytical methods that can selectively and sensitively control and monitor the presence of these emerging contaminants in various environmental compartments, and also that those methods are sustainable, and minimize the use of toxic and dangerous substances, reduce waste, and ensure operator's safety.

Solid phase extraction (SPE) is an excellent technique to clean up and preconcentrate analytes in aqueous samples. Recently, magnetic nanoparticles have gained interest due to their unique physical and chemical properties, especially their superparamagnetic properties, which enable their manipulation and separation using external magnets. Magnetic solid-phase extraction (MSPE) is an innovative option for preconcentrating a wide variety of compounds from aqueous samples that uses magnetic bars for more precise compound separation.

This master thesis project presents a novel, economical, and environmentally sustainable analytical method for extracting and preconcentrating three sulfonamides from aqueous samples using magnetic nanoparticles and MSPE. The method achieves LODs between 0.002-0.008 mg L^{-1} for the three sulfonamides selected, while LOQ values were between 0.006-0.028 mg L^{-1}. The method was applied to tap and river waters. Compared to others, the method showed advantages reflected in higher overall scores and proved to be a greener, environmentally friendly, and cost-effective alternative analytical method through AGREE and AGREEprep.