

# HEAVY METAL REMOVAL FROM WASTE WATER USING MAGNETIC NANOPARTICLE (MNP)

**Eylül Büşra Tapanyığı<sup>1</sup>, Mehmet Özdemir<sup>1</sup>, Fatma Ulusal<sup>2</sup>, Bilgehan Güzel<sup>2</sup>**

*1. Şampiyon Filtre Pazarlama Sanayi ve Ticaret A.Ş. İskenderun/TURKEY*

*E-mail: eylultapanyigit@sampiyonfilter.com.tr*

*2. Chemistry Department, Art and Science Faculty, University of Çukurova, Adana, TURKEY*

## ABSTRACT

Within the scope of the project, our main purpose is to remove heavy metals such as Zn and Cr from the wastewater generated during galvanizing the metal parts of filters of motor vehicles using magnetic nanoparticles (MNP). It is aimed that the method to be developed will produce effective methods compared to chemical precipitation methods. For this purpose, a nano-technological method has been used, which has never been used to remove zinc from wastewater. The conventional method is not very successful in reducing the zinc concentration of 5 ppm. The nanoparticles to be used within the scope of the project can be used in both small and different productions (cement, asphalt), while reducing the amount of zinc in wastewater to 1 ppm and below.

## METHODS

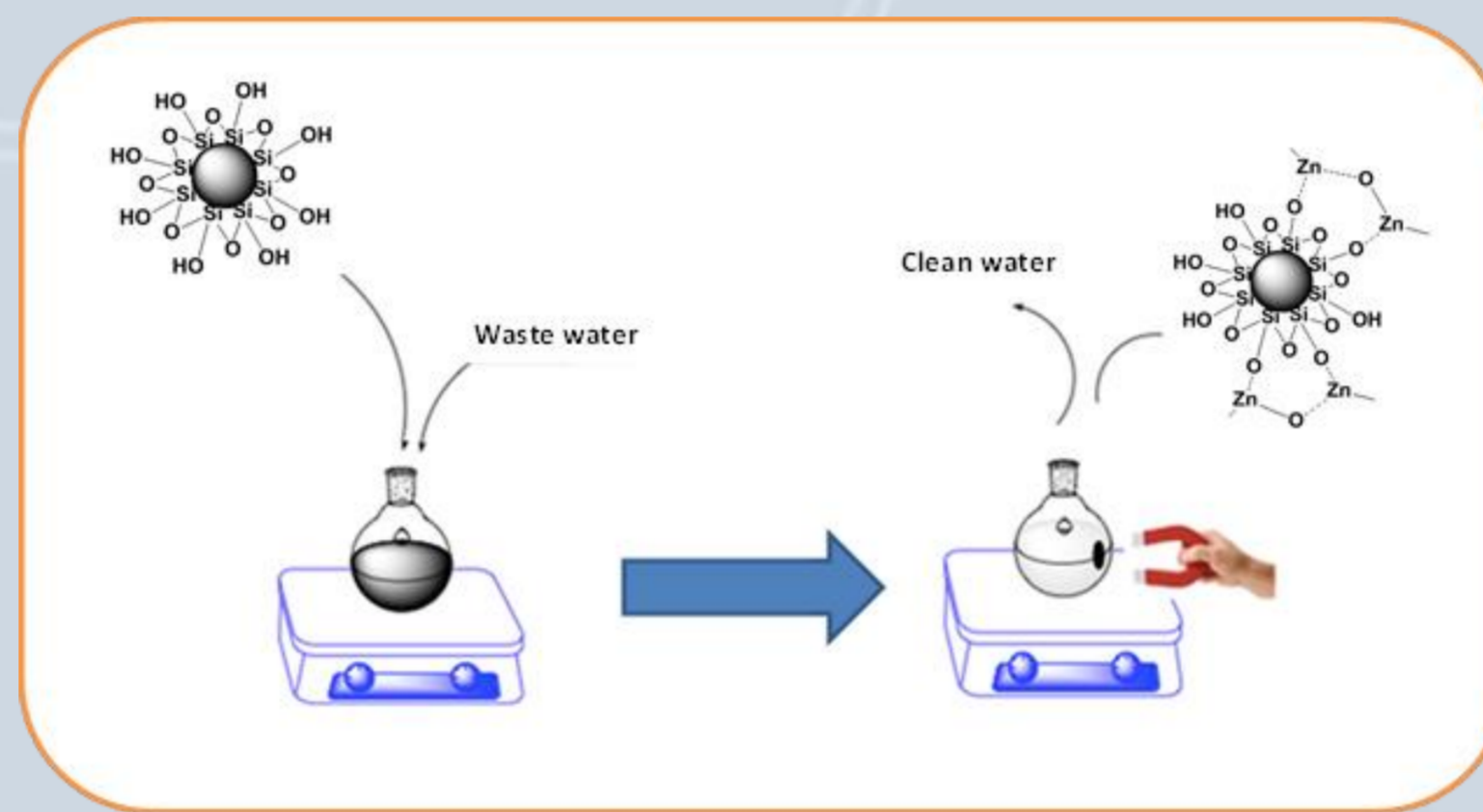


Figure 1. Schematic representation of heavy metal removal by wastewater-MNP process.

## RESULTS & DISCUSSION

- ❖ The magnetic nanoparticle targeted to be synthesized within the scope of the project has been successfully synthesized and characterized.
- ❖ As a result of the examination of the waste water of the enterprise with ICP-OES, it was determined that the average Zn (II) pollution was 849.75 ppm, Fe (II) pollution was 41.83 ppm and Cr (VI) pollution was 9.90 ppm.

Table 1. Operating waste water heavy metal concentrations

	Zn (II) concentration (ppm)	Fe (II) concentration (ppm)	Cr (IV) concentration (ppm)
Sample 1	232,3	5,78	9,85
Sample 2	119,1	34,95	11,5
Sample 3	202,7	3,59	0,07
Sample 4	177,3	12,3	8,33
Average	182,85	14,155	7,4375

- ❖ As a result of processing the wastewater samples taken from the galvanizing unit of our facility with silica coated MNPs, it has been observed that the amount of heavy metal in the wastewater is reduced to less than 10 ppm as targeted.

Table 2. Wastewater-MNP process (1000 mL wastewater 20 mg MNP)

	Initial Wastewater Heavy Metal Concentration (ppm)			Post-treatment Wastewater Heavy Metal Concentration (ppm)		
	Zn	Fe	Cr	Zn	Fe	Cr
Sample 1	232,3	5,78	9,85	0,76	0,35	0,01
Sample 2	119,1	34,95	11,5	6,3	1,9	0,1
Sample 3	202,7	3,59	0,07	1,06	0,74	0,05
Sample 4	177,3	12,3	8,33	1,43	2,1	0,3

## CONCLUSION

As a result of the studies carried out within the scope of the project, it has been determined that the average Zn (II) pollution in galvanized waste water is 849.75 ppm, Fe (II) pollution is 41.83 ppm and Cr (VI) pollution is 9.90 ppm. Studies have concluded that 20 mg of MNP will be sufficient for 1 liter of wastewater. The fact that the heavy metal pollution in wastewater has been reduced to less than 5 ppm (Zn: 1.08 ppm, Fe: 0,99 ppm and Cr: 0,15 ppm) in pilot trials of 18 L indicates that the developed method is industrially applicable.

## REFERENCES

- [1] Oğuzhan Gök, Özgül Çimen Mesutoğlu, The Use of Pirina as Low Cost Adsorbent for Removal of Heavy Metals, Journal of the Faculty of Engineering and Architecture of Gazi University (2017) 32 (2).
- [2] Boundary lubrication—An important lubrication in the following time, Yong bin Zhang, Journal of Molecular Liquids 128 (2006) 56–59.

*Acknowledgment: The authors are greatly thankful to Şampiyon Filtre R&D Center. (Project No: SF.DE.AR.2019.4)*