

Beijing, April 20, 2018

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Letter of Invitation: 7th International Congress on Arsenic in the Environment – *Environmental Arsenic in a Changing World (As2018)*, July 1-6, 2018 – Beijing, China.

Dear Dr. A. Figoli

The Organizing Committee of the 7th International Congress on Arsenic in the Environment – *Environmental Arsenic in a Changing World (As2018)*” is pleased to inform you that your paper entitled:

Arsenic removal from natural contaminated groundwaters in Calabria Region (Italy) by Nanofiltration

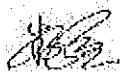
A. Figoli, I. Fuoco, C. Apollaro, R. Mancuso, G. Desiderio, R. De Rosa, B. Gabriele, A. Criscuoli
PRESENTING AUTHOR: A. Figoli

has been selected for **ORAL PRESENTATION** at the 7th International Congress on Arsenic in the Environment – *Environmental Arsenic in a Changing World (As2018)*” to be held in Beijing, China.

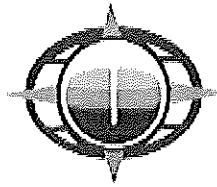
The Congress intends to integrate researchers involved in different study areas in an open forum, and to strengthen relations between academia, industry, research laboratories, government agencies and the private sector to share an optimal atmosphere and knowledge and innovation within the interdisciplinary fields of research on the theme of arsenic in the environment.

Looking forward to welcome you at As2018 in Beijing.

Yours sincerely,

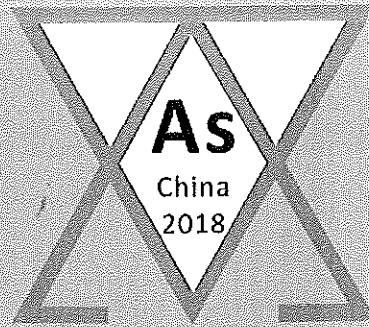


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Arsenic removal from natural contaminated groundwaters in Calabria Region (Italy) by Nanofiltration

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ABSTRACT: Nanofiltration (NF) has been applied for treating Arsenic contamination of groundwater from an area located in the Sila Massif in Calabria (Italy). High values of As in different environmental matrices, such as rocks, soils and waters, were observed. In fact, the geochemical analysis of 3 groundwaters (GWs) samples collected show As values which exceeded the permitted levels of 10 ppb. The Arsenic is present mainly in the pentavalent form (As(V)). Different types of NF membranes, operating conditions and the competing effects of different ions with Arsenic in the GWs samples have been evaluated for analyzing their effect on the arsenic removal.

1 INTRODUCTION

Arsenic is a toxic inorganic pollutant for both the environment and human health. The removal of arsenic is one of most problematic targets of hydrogeochemical research (Smedley & Kinniburgh, 2002; Bhattacharya et al. 2002; Mohan and Pittman, 2007, Ahmad et al., 2017). The WHO drinking water guideline for As has been set to 10 µg/L and it has been adopted by many countries as a drinking water standard (WHO, 2001). For reaching this new value, several separation techniques have been studied. Membrane technology is one of these and pressure driven operation as nanofiltration (NF) and reverse osmosis (RO), often applied on synthetic solutions, have been already proved to accomplish the arsenic value below the drinking water standard (Figoli et al., 2016; Ahmad et al. 2017). In this study, NF has been applied for treating As contaminated groundwaters, coming from an area located in the Sila Massif (Calabria, Italy). Sila Massif represents the major morphostructural high of the Ionian margin of north-eastern Calabria and fall in the northern sector of the Calabrian Peloritan Arc (CPA). The water samples collected, labeled GW1, GW2, GW3, have interacted with the Calabride Complex formed by Hercynian and pre-Hercynian gneiss, granite and phyllite, which underwent intense weathering processes (Van Dijk et al., 2002). The performance (water flux and arsenic rejection) of the membranes has been evaluated changing the operating pressures.

2 METHODS

The three water samples (GW1, GW2, GW3) differ by the arsenic concentration, which is about 60, 120 and 430 ppb, respectively. The Arsenic is present mainly in the pentavalent form (As(V)).

NF experiments were performed by using a laboratory pilot unit (SEPA CF), consisting of three major components: a cell body, cell holder, and feed pump. Four types of membrane modules commercialized by GE Osmonics, named HL (Polyamide), DK (proprietary thin-film) and CK (cellulose acetate) and by Microdyn Nadir, named NP030P (Polyethersulfone), were used.

The samples, before and after membrane treatment, have been analyzed, determining the major elements HPLC (Dionex ICS 1100). The total arsenic was evaluated by ICP-MS, Perkin Elmer/SCIEX, Elan DRCe.

3 RESULTS AND DISCUSSION

In Figure 1, it is reported the water flux plotted versus the trans-membrane pressure (TMP) variation, for the GW2 sample (feed stream).

All the investigated membranes show a linear increase of water flux at higher TMP. In particular, only the NF membrane Type HL shows much higher water flux compared to the other ones, which could be explained by the polymeric nature of the material as well as by its higher pore-size. The same results have obtained also for the other GW samples containing a lower and higher concentration of As(V).

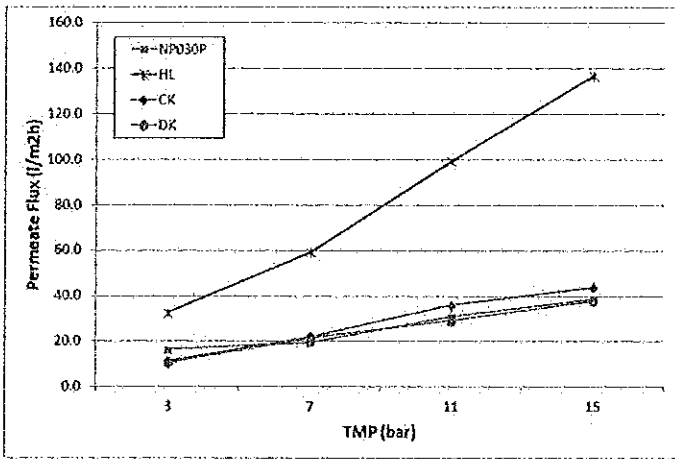


Figure 1: Effect of TMP on permeate flux for GW2 contaminated As(V) sample

In Figure 2, it is reported the As(V) rejection and the arsenic concentration detected in the permeate (purified water) after the membrane treatment of GW2 contaminated As (V) sample.

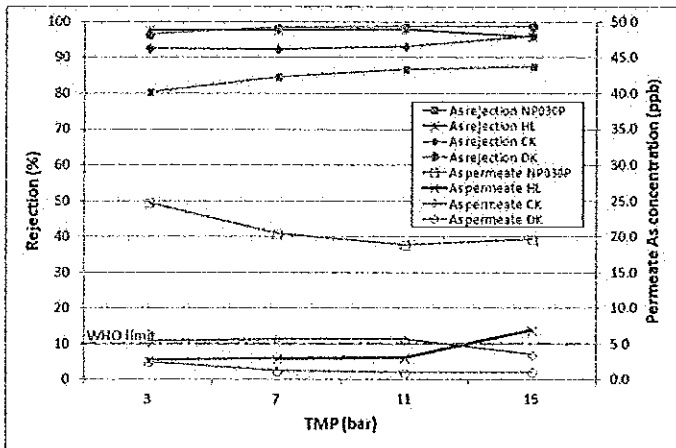


Figure 2: Effect of TMP on rejection (%) and permeate arsenic concentration for GW2 contaminated As(V) sample

The results show that all the investigated NF membranes, except the NP030P, reject the As(V) and that the As(V) concentration in the purified permeate water is below the WHO drinking water limit value of 10 µg/L.

4 CONCLUSIONS

The results clearly report that NF can be considered a valid technique for arsenic removal in the natural water, producing a permeate (purified water) with the As(V) concentrations within the allowed WHO limits for most of the membrane investigated.

ACKNOWLEDGMENT

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