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REDUCTION OF HEAVY METAL POLLUTANTS IN GALVANIC WASTEWATER BY ECO-SUSTAINABLE DEPOLLUTION METHODS

INTRODUCTION: In recent decades there is an increasing concern for environment deterioration due to the large population increase and, consequently, industrial and agricultural activity increase.
Soil and source waters (surface water and groundwater) became increasingly contaminated by a wide variety of chemical pollutants (organic and inorganic chemicals, heavy metals, etc.) of primarily industrial and agricultural origin.
These chemical pollutants tend to be persistent in environmental matrices (water, soils, sediments or biota) and are associated with soil eco-toxicological consequences (metabolic perturbation of soil resident biota, soil fertility and agricultural productivity reduction) and with health problems (cancer, birth defect, central nervous system disorders, kidney and liver toxicity, etc.).
International organizations, such as U.S. Environmental Protection Agency (EPA) and World Health Organization (WHO), are deeply involved in environment pollution matter and have established guidelines for preventing, reducing and eliminating pollution, emphasizing the importance of research and studies to identify the best available technology for preventing and reducing pollution which could be not only effective but could have both economically and feasible application.
EUREKA Research Institute (Italy) for years is dealing with environment depollution, trying to develop methods and homeopathic remedies able to support soil and water cleanup in both economical and feasible way.

AIM: The aim of this study was to verify the efficacy of EUREKA homeopathic remedy (A70) recently studied for Galvanic industry wastewater depollution, in reducing Chromium VI and Nickel load in wastewater.

MATERIALS AND METHODS: 60 litres of wastewater from Galvanic industry, taken before the wastewater enters the physical-chemical depollution system, was divided into two tanks (30 litres/tank): Tank 1 was the Control, Tank 2 was the Treated.
A sample of Control has been immediately sent to the laboratory for chemical analysis (sample of 09.28.2015 - Basal Sampling).
Tank 2 was treated 2 times with A70-EUREKA remedy (1 ml of A70 in 1 m^3 of Galvanic wastewater), the first time on 09.29.2015 and the second one approximately after 2 weeks (on 10.12.2015).
Both Tank 1 and Tank 2 have been hermetically sealed and carefully preserved in order to avoid wastewater evaporation or accidental liquid leakage during the whole study.
After about 20 weeks from the first A70-EUREKA remedy treatment, samples from both Tank 1 and Tank 2 were sent to the laboratory for chemical analysis (sample of 02.15.2016 – Final Sampling).

RESULTS AND DISCUSSION: After 20 weeks from the first A70-EUREKA remedy treatment the amount of Chromium and Nickel in the Tank 2 sample (Treated) was reduced by about 40% and 15%, respectively, in comparison to the Control (Table 1).

Remarkably, the amount of Chromium and Nickel in Tank 1 (Control) (02.15.2016 – Final Sampling) was significantly increased in comparison to the Basal Sampling (Control, 09.28.2015 Sampling): Total Chromium = +80%; Chromium VI = +92%; Nickel = +345%.

On the contrary, the amount of Chromium and Nickel in Tank 2 (Treated) (02.15.2016 – Final Sampling) was less increased in comparison to Tank 1 – Basal Sampling, particularly for Chromium amount: Total Chromium = +8%; Chromium VI = +13%; Nickel = +279%.
These results are quite remarkable, taking into account that both Tank 1 and Tank 2 were hermetically sealed, kept in the same place and that no accidental liquid leakage occurred during the test.

Nevertheless these results could be explained in view of the ratio between total disposable portion and analytically detectable portion of heavy metal ions in water solutions, which could vary primarily with environmental temperature and light, pH, or progressively motionless of water solution during the test course. To better understand the observed phenomenon, it should be necessary to repeat the test with serial analytical monitoring of Control and Treated amount of Chromium and Nickel, while Control and Treated should be kept in continuous motion during the whole course of the study.

TABLE 1 - ANALYTICAL RESULTS

	BASAL SAMPLING (Tank 1)	**FINAL SAMPLING (Tank 1)**	**FINAL SAMPLING (Tank 2)**	**PERCENTAGE VARIATION**
	Control	**Control**	**Treated** (A70-EUREKA remedy)	**Treated-Control**
	09.28.15 Sampling	02.15.16 Sampling	02.15.16 Sampling	02.15.16 Sampling
pH	7,79	6,85	7,99	
Total Chromium	12,7 mg/kg	22,89 mg/kg	13.68 mg/kg	**-40%**
Chromium VI	12,0 mg/kg	23,00 mg/kg	13,50 mg/kg	**-41%**
Nickel	0,33 mg/kg	1,47 mg/kg	1,25 mg/kg	**-15%**

Anyway, the analytical results on Tank 1 and Tank 2 in Final Sampling, with reduction of about 40% of Chromium amount in Tank 2 (Treated) is quite remarkable considering the same storage conditions of both Tank 1 and Tank 2. These results suggest that the observed difference in the heavy metal ions amount, detected at the end of the study, could be related to the use of A70-EUREKA remedy in Tank 2.

CONCLUSIONS: The use of A70-EUREKA remedy in Galvanic wastewater is associated with a reduction of about 40% and 15% respectively in the amount of Chromium and Nickel load, after 20 weeks from the beginning of the test, in comparison to the Galvanic wastewater Control.

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