

Chromium removal by Onewater®

Water contamination by chromium is a serious environmental and health problem, so different assays are carried out for removing chromium with Onewater® method.

1. Water source

Water used for testing is prepared in our laboratory. Assays have been carried out with potable water to which has been added chromium until achieving a similar concentration to that found in groundwater contaminated with chromium (about 5 ppm) in some cases.

2. Analytical methods

Chromium results present in water are analysed with measuring strips. These strips determine the amount of chromate ($\text{mg CrO}_4^{2-}/\text{L}$), from chromate, equivalent chromium may be obtained (Cr).

Some analysis have been done through external laboratories.

Strips provide a range of values to the results, they do not determine the specific amount of chromate. In the event that a result is within a range of values but clearly visible decanted towards one of them, this value will be underlined (Example: 5-10 means that the strip appreciation naked eye shows that the value of the result is nearer to 5 than to 10).

3. Results

The following tables show the results for different assays.

3.1. Water with chromium

Assay	Initial conditions	Input		Output		Observations
		Chromate (mg CrO ₄ ²⁻ /L)	Equivalent chromium (mg Cr ⁶⁺ /L)	Chromate (mg CrO ₄ ²⁻ /L)	Equivalent chromium (mg Cr ⁶⁺ /L)	
Batch	pH acidified = 3	10-30 (s)	4.5-13.5 (s)	0-3 (t)	0-1.4 (s)	Stoichiometric concentration input ≈ 5 mg Cr/L
Continuous 1	pH no acidified = 8.5	10-30 (s)	4.5-13.5 (s)	0-3 (t)	0-1.4 (s)	
			5125 µg/L (*)		< 5 µg/L (**)	
Continuous 2	pH acidified = 3	10-30 (s)	4.5-13.5 (s)	0-3 (t)	0-1.4 (s)	
			4788 µg/L (*)		< 5 µg/L (**)	
Continuous 3	pH no acidified = 7.6	-	1200 µg/L (*)	-	< 20 µg/L (**)	
Continuous 4	pH no acidified = 7.6	-	918 µg/L (*)	-	< 5 µg/L (**)	

(s) Analysis performed by test strips which provide a range of values.

(*) Results provided by a certified external laboratory.

(**) Results provided by a certified external laboratory. <5 µg/L and <20 µg/L are the devices limits of detection depending on the method used by the external laboratory for the measurement. Then, the real chromium result is below 5 µg/L or 20 µg/L.

4. Conclusions

In the case of Spain, the limitation for human consumption of chromium is 50 µg/L, that is, 0.05 mg/L).

Hence, from the results obtained, Onewater® method has been confirmed as an efficient treatment for water contaminated with chromium.

Starting out from 5 mg/L of chromium as potable water contamination, it is possible to achieve practically total removal of chromium (less than 0.005 mg/L).

Chromium concentration present in water is reduced by means of Onewater®, under the studied conditions. According to the obtained results, for initial concentrations of chromium contamination within the range studied, similar results as obtained are estimated. For much more elevated concentrations of chromium additional assays should be done.

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