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Novel technics for hexavalent chromium removal from waters – exploring the wide offer of methods proposed in the recent scientific litterature

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In an era of ever increasing production of new molecules and new materials, the development of new methods for water treatment, for the extraction of water soluble pollutants, is an ever lasting rapidly evolving field of research. In this report, we will investigate the amazing creativity around the search for new methods for the removal of hexavalent chromium.

Cr(VI) is extremely toxic, and most Cr(VI) bearing compounds are highly soluble in water. Chromium is intensely used in the industry since the early 19th century and Cr(VI) has been released to surface and groundwaters since that time. Principal culprits are the mining industry with mine drainage, metallurgical wastes (COPR in particular), the electroplating industry and tanneries.

Fight against past pollutions, abatement of concentrations in contemporary industrial effluents and the need to meet drinking water regulatory values, all these efforts demand efficient and timely treatment technology.

Cr(VI) can be removed from water by means of chemical adsorption, reduction to Cr(III) or a combination of both. In current practice, water treatment is most often conducted through chemical reduction using reduced sulfur compounds, Fe(II) compounds or zero-valent iron. Although these treatment techniques are efficient and well established, the scientific literature offers an amazing amount of research papers exploring novel methods for Cr(VI) removal from industrial and environmental waters. Some of them may use more eco-friendly reagents, produce less waste, facilitate recycling, or simply be easy to generate and to apply.

Our study reviews this profusing offer of methods. In a graphical overview, the methods are grouped as a function of main criteria such as type of reagents, recyclability of treatment reagents, energy yields, waste recovery, concentration abatement and, very importantly, the level of technical advancement of the published method.