PHOTOREDUCTION OF Cr^{6+} USING CdS IN PRESENCE OF VISIBLE LIGHT

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Hexavalent chromium is toxic and mutagenic metal ion in biological systems and is used in many industrial applications; according to the World Health Organization (WHO) is one of the most toxic metals in the nature.[1,2] In this study, CdS was employed for the photoreduction of Cr^{6+}. The CdS was prepared in two single steps by the obtaining of CdAl precursor material using the coprecipitation method and contacting that material with a sulfur source, in order to form CdS. The XRD pattern corroborates the CdS structure; the band gap value of 2.1 eV indicates the possible photoactivity of the material in the visible region of the spectrum. The CdS photocatalyst (0.025 g) was tested in a first step at room temperature and employing two lamps of 6000 K (30W) as a visible radiation source. A solution of $K_2Cr_2O_7$ (30 ppm of Cr^{6+}) was used as chromium source and citric acid was added as sacrificial agent. The evolution of the photoreduction of Cr^{6+} to Cr^{3+} was measured with a UV spectrophotometer, following a known method for water analysis for the measurement of hexavalent chromium in natural waters, saline waters, wastewaters and treated wastewaters.[3,4] The values of Cr^{6+} concentration in the solution were calculated using a calibration curve previously plotted. It was observed that the pH value of the medium has a significant influence on the efficiency of Cr^{6+} photoreduction, reaching the best reduction percentages at lower pH values: 100% after 1 hour of irradiation at pH 1.34 vs. 73.4% at a pH of 1.99, 58.6% at pH 5.60 (without adjusting pH of the medium) and 0.0% at pH 8.40 after 3 hours of irradiation in these cases; when citric acid (CA) is added, it is possible to achieve a higher photoreduction after 3 hours (Fig.1).

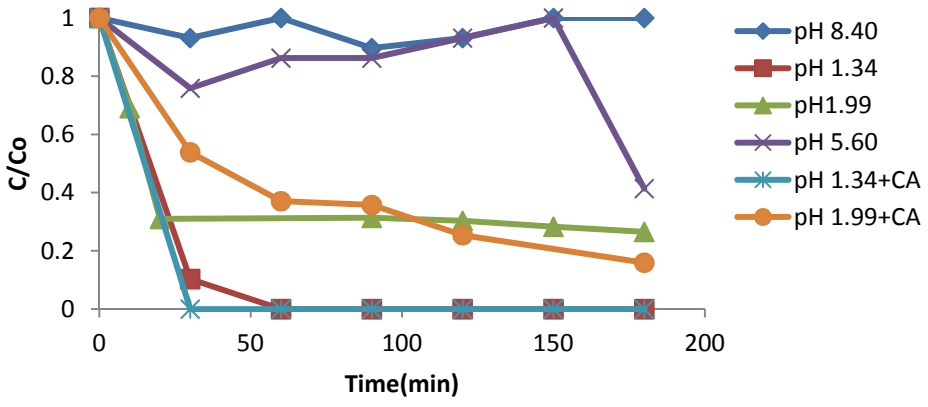

Figure 1. Photoreduction of Cr^{6+} at different pH with and without CA (citric acid)

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