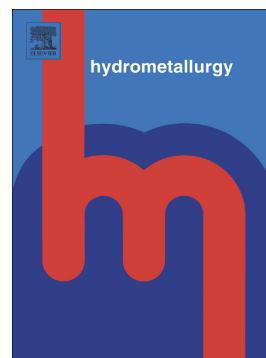


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# Mechanism of poisoning hydroxyoximes by cobalt in different organic systems

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## Abstract

Poisoning of 2-hydroxy-5-nonylbenzaldoxime (Mextral 84H) by cobalt in the presence of neodecanoic acid (Versatic 10) and bis(2-ethylhexyl) phosphoric acid (P204) diluted in aliphatics was comparatively studied. The cobalt-organic extractants species structure and stoichiometry were determined by slope analysis, Fourier transform infrared (FT-IR) spectrometer, visible absorption and cyclic voltammetry. It is found that P204 can significantly inhibit the poisoning of Mextral 84H by cobalt and the poisoning is weakened with the increase of P204 concentration while Versatic 10 has no effect on it. The stoichiometries of adducts formed in the organic phase with Mextral 84H (HL) in the presence of Versatic 10 and P204 (HA) are  $\text{CoL}_2 \cdot 2\text{H}_2\text{O}$  and  $\text{Co}(\text{H}_2\text{A}_2\text{L}_2)$ , respectively. The divalent cobalt in the  $\text{CoL}_2 \cdot 2\text{H}_2\text{O}$  complex is easily oxidized to trivalent cobalt because of its inner-orbital  $d^2sp^3$  hybridization, resulting in low oxidation potential and the poisoning of Mextral 84H by cobalt in the presence of oxygen. With the addition of P204, the hybridization configuration of the cobalt complex transforms from  $d^2sp^3$  to the more stable  $sp^3d^2$ , and the oxidation potential of divalent cobalt in the organic phase significantly increases to prevent the  $\text{Co}(\text{H}_2\text{A}_2\text{L}_2)$  complex from being oxidized, resulting in the significantly inhibition of the poisoning Mextral 84H by cobalt in the presence of oxygen.

**Keywords:** Poisoning by cobalt; Mextral 84H; Organic acids; Synergistic solvent extraction; Extraction mechanism; Poisoning mechanism

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