Spectrophotometry of the Platinum Metals in the Ultraviolet Region

III. Determination of Platinum(IV) *

Spektrophotometrie der Platinmetalle im UV-Bereich.

III. Bestimmung von Platin(IV)

Best. von Platin(IV); Spektralphotometrie; UV-Bereich

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The present paper, which is part of a systematic study of the use of ultraviolet spectra in the analysis of the noble metals, describes the possibilities of the spectrophotometric determination of platinum(IV) as chlorocomplex within the region 200–350 nm. An investigation of the effect of pH on the absorption curve revealed that in unbuffered HCl media pH 1–4 the height of the absorption maximum at 262 nm is not affected, whereas in buffered media pH 1–9 this height decreases up to pH 6.5 with a slight increase after that. Determinations of 1–15 mg of platinum showed a relative error of about 0.9%. Beer's law is obeyed. CrO_4^{2-} interferes, Fe(III) and Pd(II) interfere when present in amounts higher than 0.1 g. According to our recent experiments, it is possible to separating platinum by extraction with, e.g., 2-methylisobutylketone. On the other hand, 35 g of Na_2SO_4 , 20 g of NaNO_3 , 60 g of KBr, 60 g of KCl, 30 g of NaCl, 60 g of NaClO_4 , 30 g of H_3PO_4 , 50 g of H_3BO_3 , and compounds of Mn, Cu, Ti, Zn, Ca, Ni, Al, Mg, Rh, Ir and Cr(III) do not interfere.

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Detection of Platinum(IV) with Largactil (Chlorpromazine Hydrochloride)

Nachweis von Platin(IV) mit Largactil
(Chlorpromazinhydrochlorid)

Nachw. von Platin(IV) mit Largactil, Chlorpromazinhydrochlorid

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The common tranquilizer and adrenolytic drug largactil (thorazine) has been used for the microgram-level detection of platinum(IV). Its solution in dil. hydrochloric acid gives a bluish colouration or

Table 1

Sample type	The Pt content		
	Laboratory I	Laboratory II	Laboratory III
Solution 1	—	0.0050 g/l	0.0055 g/l
Solution 2	—	0.0350 g/l	0.0378 g/l
Solution 3	—	0.0860 g/l	0.0888 g/l
Solution 4	—	0.0130 g/l	0.0135 g/l
Catalyst			
solid I	0.512%	0.524%	0.518%
solid II	0.471%	0.462%	0.467%

Laboratory I: the method is not specified.

Laboratory II: spectrophotometry with SnCl_2 (403 nm).

Laboratory III: UV-spectrophotometry (262 nm).

The described procedure was applied with satisfactory results to the analysis of platinum solutions and reforming catalysts (see Table 1).

Procedure

A. Solutions containing nitric or hydrochloric acid are evaporated to dryness and the evaporation is repeated after addition of hydrochloric acid. The residue is taken up with hot 0.1 M HCl and is transferred into a volumetric flask. The absorbance is measured at 262 nm and the content of platinum(IV) is calculated using a calibration curve.

B. Solid Samples. The weighed sample is decomposed by a mixture of HNO_3 and HCl (1:2), the nitrogen oxides are removed by evaporating with hydrochloric acid to dryness, the residue is taken up with hot 0.1 M HCl, and is transferred into a volumetric flask. The measurement and evaluation are performed in the same manner as above.

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greenish precipitate with a warm solution of Pt(IV). The intensity and quality of the coloured product is enhanced on adding dil. ammonia solution. Limit of detection is $40 \mu\text{g Pt(IV)}$; limit of dilution is 1:12500. Most cations and anions do not interfere. I^- , SCN^- , VO_3^- , $\text{S}_2\text{O}_3^{2-}$, $[\text{Fe}(\text{CN})_6]^{4-}$, $[\text{Fe}(\text{CN})_5\text{NO}]^{2-}$, large quantities of Fe(III), and oxidizing ions, such as IO_3^- , IO_4^- , NO_2^- , CrO_4^{2-} , $\text{Cr}_2\text{O}_7^{2-}$, and $[\text{Fe}(\text{CN})_6]^{3-}$ interfere. In the presence of Cu(II), Fe(II), Fe(III), Cr(III), and Hg(I), the ammonia treatment step in the test must be avoided.

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