with chromium following the given procedures. Based upon this, a method for the simultaneous determination of aluminium and chromium has already been developed [5].

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Titrimetric Determination of Cobalt(II) with EDTA Using 1-(2-Pyridylazo)-2-phenanthrol (PAP) as a Visual Indicator

Titrimetrische Bestimmung von Kobalt(II) mit ÄDTA unter Verwendung von 1(2-Pyridylazo)-2-phenanthrol (PAP) als visueller Indikator

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It was considered worthwhile to investigate the potentialities of 1-(2-pyridylazo)-2-phenanthrol (PAP), as a visual indicator for the titrimetric determination of cobalt(II) with EDTA as the usual indicators employed for that purpose suffer from certain disadvantages. In case of PAP, the end-point obtained is sharp, the titration can be carried out directly at ordinary temperature and interference of many metal ions can be avoided. Moreover, the reaction is very sensitive [2] (sensitivity = $0.0020 \mu\text{g Co cm}^{-2}$ for $\log \frac{I_0}{I} = 0.001$).

Cobalt forms a reddish complex with PAP. Accurate results in the micro determination of cobalt are obtained in the pH range 4.8 to 6.0. The temperature range found suitable for determination is 20°C to 55°C . Below 20°C , the colour change takes place slowly and above 55°C , the colour change is reached before the end-point. Two drops of indicator solution (0.01 M in dioxan) are sufficient for the colour change to take place instantaneously from yellow to pink. However, too large an amount of indicator results in dark colour and makes visual observation of colour change difficult at the end-point.

The following diverse ions did not interfere in the determination of 2.98 mg of cobalt present in 25 ml, when present in amounts given in mg in parentheses: Cl^- (500), Br^- (500), I^- (500), NO_3^- (500), PO_4^{3-} (500), citrate (500), oxalate (500), tartrate (500), thiourea (500), sulphate (500), thiosulphate (500), sulphite (550), borate (500), iodate (500), nitrite (500), Ca^{2+} (10), Mg^{2+} (10), Ba^{2+} (10), Sr^{2+} (12), Mn^{2+} (4). However, cadmium, mercury(II), aluminium, copper, nickel and iron(III) interfere.

Interference due to 5 mg each of cadmium, aluminium, mercury(II), copper, iron(III) could be avoided using iodide, fluoride, iodide, thiosulphate and tartrate, respectively, as masking agents.

Recommended Procedure. Pipette out 5 ml of 0.01 M EDTA solution into a ground-glass flask, buffer to pH 5.5 with sodium acetate-acetic acid buffer and add two drops of indicator solution (0.01 M in dioxan). Titrate with cobalt solution taken in a microburette. Shaking is necessary after each addition of cobalt solution. A sharp colour change from yellow to pink indicates the end-point.

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