CHAPTER - VII

SUMMARY

The research in application of analytical reagents is steadily increasing, and new methods for the determination of elements are continually being developed under specific environments. The growth of science and technology demands a corresponding development in methodology and in techniques of analysis. Therefore, though several methods already exist for the analysis of each element, the search for new methods which are more specific, selective and sensitive, continues. It is necessary and therefore, important to develop new simple methods of analysis of elements. We have investigated new reagent, 2-benzoyl pyridine guanylhydrazone (BPG) and studied its applications.

BPG forms complexes with metal ions. The first chapter deals with synthesis and characterization of the reagent. Chapters two, three, four, five and six deal with the methods of determinations of cobalt (II), nickel(II), iron (II), copper (II) and silver (I) respectively.

Cobalt is estimated in alkaline medium at 422 nm and a procedure for the analysis of high speed steels has been developed. A method for the determination of micro quantities of nickel has been developed. Nickel forms yellow complex and can be estimated at pH 12.0 at 405 nm. The method has been applied to analysis of steel. Iron (II) forms yellow complex in alkaline medium and measured at 415 nm. This method can be used for the analysis of fesovit syrup. Copper can be determined at 418 nm in alkaline medium. The method is both sensitive and selective and used for the analysis of brass alloy. For the determination of silver (I), a method has been developed in alkaline medium and has been applied for the analysis of copper-silver alloy.

As compared with other reagents, BPG forms complexes instantaneously and thus shortens the time required for estimation. BPG is stable in air. There is no action of light on the reagent. So no special care is required to protect it from light.

Fig. 7.1 and 7.2 show the spectral characteristics of complexes.

In Fig. 7.1, the absorption maxima (λmax) for complexes are shown.

Fig. 7.2 is a plot of extination coefficients of the various complexes studied. The molar absorptivities of complexes are between 9.196×10^3 and 1.991×10^4 $l\ mole^{-1} cm^{-1}$, which are shown in the figure 7.2. These methods are suitable when the metal ion is present upto 3 ppm. These methods can be applied at trace levels.

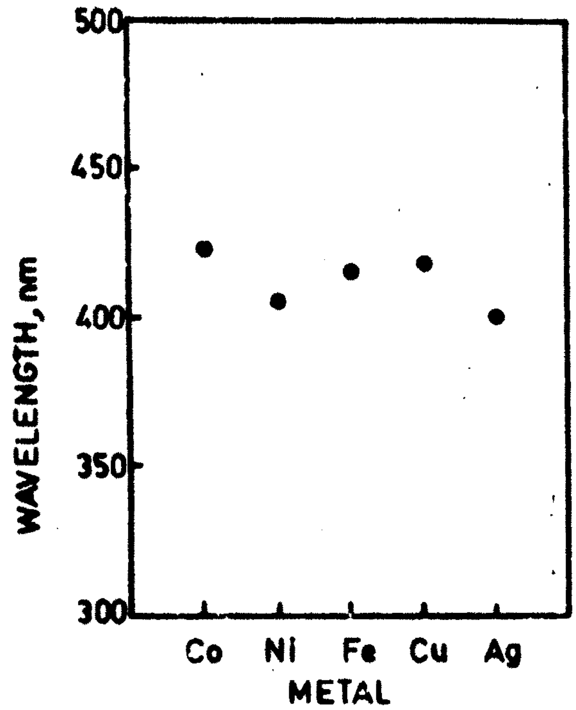

FIG.7·1

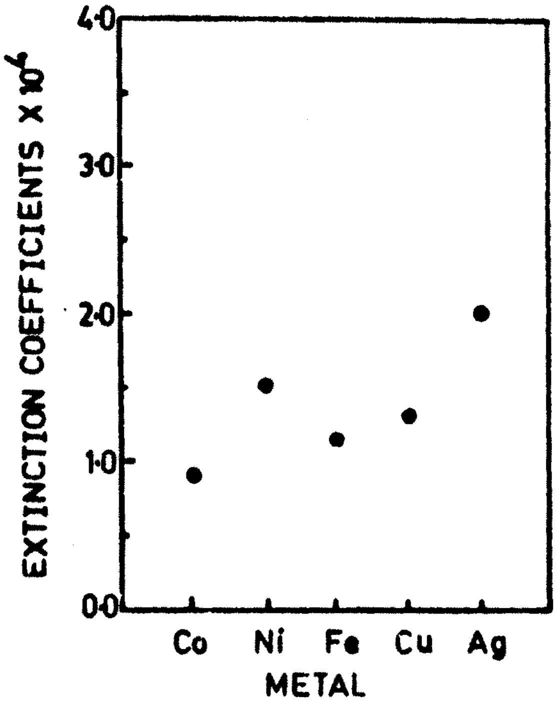

FIG.7·2

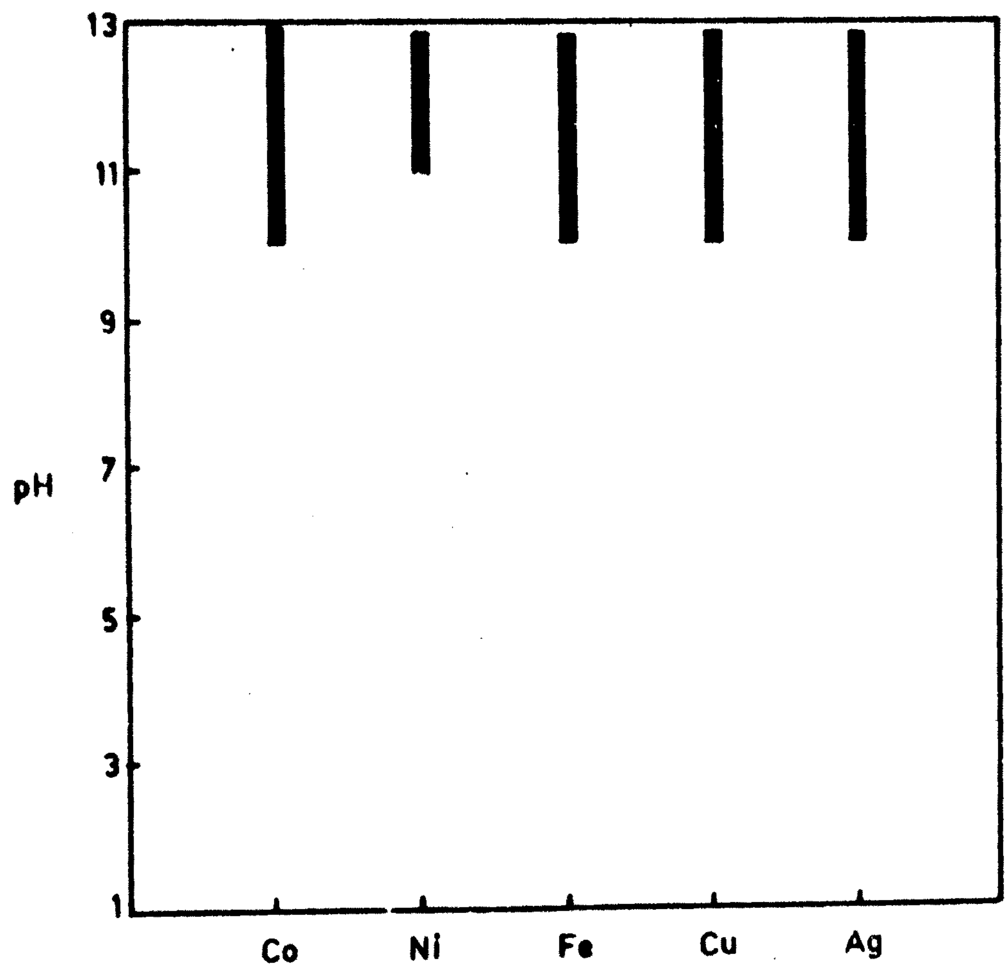

FIG.7·3 OPTIMAL pH ZONES

Fig. 7.3 shows the pH ranges over which the absorbance remains constant. In most of the cases, the recommended methods give constant readings over a range of about 2 pH units.

The λmaxs, molar extinction coefficients, pH values and composition of the complexes are given in table 7.1.

Table 7.1 : Spectral characteristics of complexes :

Metals	λmax	Molar extinction coefficients, ϵ	pH values	Ratio (M:L).
Cobalt(II)	422 nm	9.196×10^3	12.5	1:2
Nickel(II)	405 nm	1.497×10^4	12.0	1:2
Iron (II)	415 nm	1.161×10^4	10.0	1:2
Copper(II)	418 nm	1.300×10^4	12.0	1:2
Silver (I)	400 nm	1.991×10^4	11.0	1:1

Thermodynamic stability constants calculated for the metal-BPG complexes are given in table 7.2.

Table 7.2 : Thermodynamic stability constants :

Metals	K
Cobalt (II)	1.418×10^{-12}
Nickel (II)	1.715×10^{-12}
Iron (II)	9.376×10^{-12}
Copper (II)	6.543×10^{-12}
Silver (I)	3.529×10^{-7}

The interferences and tolerance limits of foreign ions is discussed for each element seperately. However no general statement can be made regarding this aspect. Selectivity and sensitivity of the reagent is fairly good.

It can be concluded that BPG is fairly good photometric reagent for the determinations of metals reported in this dissertation.