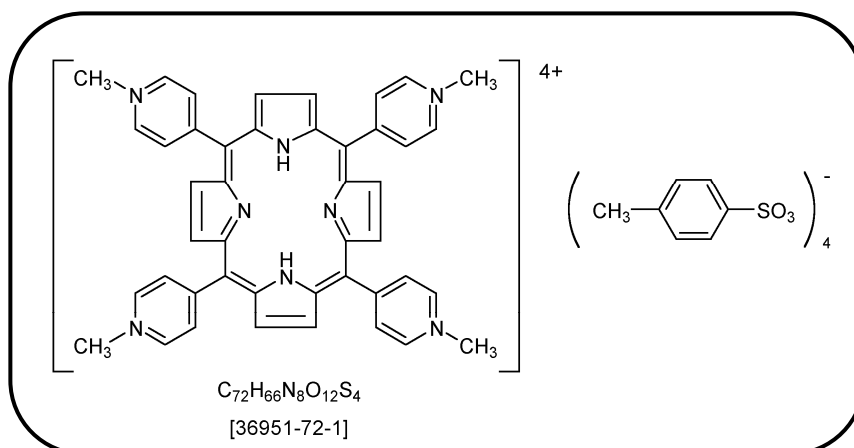


# TMPyP

## $\alpha, \beta, \gamma, \delta$ -Tetrakis(1-methylpyridinium-4-yl)- porphyrin *p*-Toluenesulfonate



Porphyrins are a group of organic compounds, which include the porphine nucleus structure, that act as quadridentate ligands to form chelate bonds with a transition metal ion. The strong chromophores of the porphine skeleton due to its  $\pi$  electronic conjugation lead to Soret absorption band of the porphine skeleton. Their molar absorption coefficients are from  $2$  to  $6 \times 10^5$   $L \text{ mol}^{-1} \text{ cm}^{-1}$  in a visible spectrum (from 400 to 500 nm). Therefore, synthetic porphyrins have been studied as possible reagents for sensitive absorption spectrometry. Among them, water soluble porphyrins, which have hydrophilic groups at their *meso* positions, are easy-to-handle, stable compounds for analyzing reagents. In fact, highly sensitive quantitative analyses for many metals have been developed.<sup>1)</sup> Here, the features and the applications of TMPyP, a water-soluble porphyrin, are shown as follows:

*Soret absorption band:* A very strong absorption band, named after its discoverer Jacques-Louis Soret, in the blue region of optical absorption spectrum.

*The meso positions of a porphyrin ring:* The positions of the carbons sandwiched between two pyrrole rings.

### 1. Property

Water soluble,  $pK_{a1} = 0.8$ ,  $pK_{a2} = 2.06$

$\lambda_{\text{max}}$  422 nm,  $\varepsilon = 2.3 \times 10^5 / L \text{ mol}^{-1} \text{ cm}^{-1}$  ( $H_2O$ );

$\lambda_{\text{max}}$  445 nm,  $\varepsilon = 2.9 \times 10^5 / L \text{ mol}^{-1} \text{ cm}^{-1}$  (1 M HCl)

### 2. Storage

Keep tightly closed. Store in a cool and dry place.

**Keywords :** TMPyP, chelating reagent, porphyrin

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### 3. Typical Analytical Procedure

#### Cu(II) Analysis<sup>2)</sup>

##### Absorption photometry by TMPyP

The test solution which contains not more than 3.5  $\mu\text{g}$  of Cu(II) is added to a 25-mL volumetric flask. To this solution, 0.5% aqueous hydroxylamine solution (1 mL), 1 M aqueous acetate buffer (1 mL, pH 4.5) and 0.08 mM TMPyP solution (1 mL) are added. The mixture is allowed to stand at room temperature for 2 min, and then 9 M sulfuric acid (4 mL) was added. Water is added to adjust the volume to 25 mL. An absorbance of the sample ( $A$ ) and the blank ( $A_0$ ) at 434 nm with a 1-cm cell is measured and  $A - A_0$  is calculated.

\*The authors reported that an apparent molar absorption coefficient was  $2.46 \times 10^5/\text{L mol}^{-1}\text{cm}^{-1}$

#### Mg(II) Analysis<sup>3)</sup>

##### 1. Pretreatment

To a test solution (15 mL) which contains not more than 2  $\mu\text{g}$  of Mg(II) in a sample tube ( $\phi = 3.5$  cm,  $h = 7.5$  cm, total volume 50 mL) equipped with a taper cap, a buffer prepared from 1 M aqueous borax solution and 1 M aqueous sodium hydroxide solution is added to adjust to pH 10.0. To this mixture, 0.02% dithizone- $\text{CCl}_4$  solution (10 mL) is added and the mixture is shaken for 15 min and centrifuged at 1000 rpm for 10 min. After removal of the organic phase, the aqueous layer is filtered through Whatman No.42 filter paper to remove any precipitate. To the aqueous layer, 1 M HCl (2 mL) is added to make pH 1.0 and  $\text{CCl}_4$  is added. The mixture is shaken for 5 min to remove dithizone which remains in the aqueous layer. The aqueous layer is subjected to Mg(II) analysis.

##### 2. Fluorometry by TMPyP

The test solution (10~20 mL) which contains not more than 2  $\mu\text{g}$  of Mg(II) is added to a 50-mL Erlenmeyer flask. To this solution, 1 mM aqueous oxine solution (2.5 mL), 0.1 mM aqueous TMPyP solution (1 mL) and 0.1 M borax-NaOH buffer (1 mL) are added and pH is adjusted 9.1~10.6. The mixture is heated in a boiling water bath for 60 min. After cooling at room temperature, the mixture was transferred to a 25-mL volumetric flask to adjust the volume to 25 mL. The 1-mL sample is taken from the mixture and the fluorescent spectrum is measured at 451 nm for excitation and at 641 nm for emission.

\*The fluorometer is calibrated as the fluorescent intensity becomes 100% at 451 nm for excitation, 641 nm for emission by using 1.5 mM *N,N*-dimethyl-*m*-nitroaniline solution (30% benzene, 70% hexane).

Other Cu(II) analysis examples, Watababe *et al.* reported that an extraction of the ionic associate of dodecylbenzene sulfonate with Cu(II)-porphine complex formed at room temperature. It used polyoxyethylene nonionic surfactant as an extractant in the presence of L-cysteine at pH 5.2, and absorptiometric analysis of the extract.<sup>4)</sup> Yoshimura *et al.* reported a microdetermination method for copper by ion-exchange resin.<sup>5)</sup> Additionally, Igarashi *et al.* developed a simultaneous spectrophotometric determination of  $10^{-8}$  to  $10^{-9}$  g/cm<sup>3</sup> levels of metal ions (Cu(II), Zn(II), Pd(II)) by HPLC with TMPyP.<sup>6)</sup>

#### Product

A5014 TMPyP [= $\alpha,\beta,\gamma,\delta$ -Tetrakis(1-methylpyridinium-4-yl)porphyrin *p*-Toluenesulfonate]  
100 mg 1 g

#### References

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