

Electrochemical Polymerization of Co(II)- 4, 4', 4'', 4'''-tetracarboxyphthalocyanine

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Owing to their highly delocalized conjugated π electron system, metallophthalocyanines exhibit interesting properties and offer a wide range of applications¹. Furthermore, polymeric metallophthalocyanines are expected to possess electronic conductivity, electrocatalytic properties and to offer efficient corrosion protection to metal surfaces².

The present study intends to investigate the possibility of obtain a polymeric metallophthalocyanines via electrochemical polymerization. Initially, the monomer Co(II) 4, 4', 4'', 4'''tetracarboxyphthalocyanine (TCPCo) was synthesized by the hydrolysis of Co(II)- 4, 4', 4'', 4'''tetracarboxamidephthalocyanine (TCAPCo)³ as shown in figure 1:

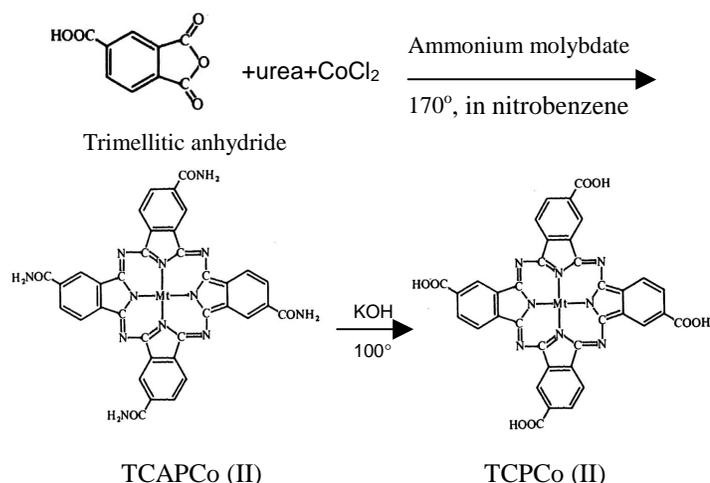


Figure 1: Schematic representation of the synthesis of Co(II) 4, 4', 4'', 4'''tetracarboxyphthalocyanine.

Electrochemical synthesis of polymeric Co(II) 4, 4', 4'', 4'''tetracarboxyphthalocyanine is the current method because it offers some advantages over other techniques, as it can be used with numerous surfaces and generally leads to the direct deposition of a uniform film⁴. The TCPCo (II) polymerization was carried out by cycling the potential between -0.2 and 0.9V at 200mV/s . A glass cell with 250mL of supporting electrolyte (DMSO/ 0.1M tetraethylammonium perchlorate.), with an Ag/AgCl reference electrode, a Pt foil as counter electrode and a carbon steel having an exposed area of 1.2 cm^2 as working electrode were used. All measurements were conducted in a EG&G PARC model 273 potentiostat/galvanostat, at room temperature.

Figure 2 shows the cyclic voltammograms obtained during the polymerization process of Co(II) 4, 4', 4'', 4'''tetracarboxyphthalocyanine in DMSO/ 0.1M tetraethylammonium perchlorate. A redox process seen at

about 0.2V increased continuously with successive cycles in the studied potential range. At the end of positive scan the large currents observed may result from oxidation of the monomer. Probable is this irreversible process that leads to a progressive mass gain, as the electroactive polymeric film build up on the electrode surface. It can be concluded that electrochemical polymerization of Co(II) 4, 4', 4'', 4'''tetracarboxyphthalocyanine is an efficient method and results in an homogeneous and adherent polymeric films.

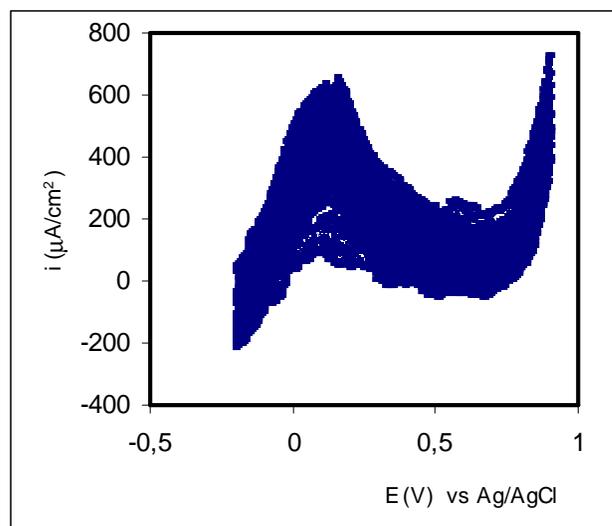


Figure 2: Cyclic voltammogram registered during the electroformation of Co(II) 4, 4', 4'', 4'''tetracarboxyphthalocyanine in DMSO/ 0.1M tetraethylammonium perchlorate, at 200mV/s . The working electrode was a carbon steel.

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References

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