



# Novel Co(II) phthalocyanines of extended periphery and their water-soluble derivatives. Synthesis, spectral properties and catalytic activity



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## ABSTRACT

Novel complexes of cobalt and copper with substituted phthalocyanines were synthesized and characterized. Their water-soluble derivatives were obtained by sulfonation under mild conditions and structurally proved. Aggregation equilibrium in water mediums was shown and influence of geometrical and electron parameters of macroheterocycle peripheral substituents on these processes was established. Catalytic activity upon liquid-phase oxidation of N,N-diethylcarbamdithiolate to thiuram E was studied. Kinetic parameters of substrate oxidation in presence of cobalt phthalocyanines were considered.

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## 1. Introduction

Metal phthalocyanines exhibit prospective chemical and photophysical properties as individual compounds and parts of composites or hybrid materials [1–3], high catalytic activity upon redox processes [4–6]. Oxidation of mercaptans [7–9] and olefins [10,11] are of special attention. One more prospective direction of metal phthalocyanines application is sensorics [12,13]. Development of phthalocyanine macrocycle structure via introduction of substituents into peripheral and non-peripheral positions allows reaching of fine tuning their physical and chemical properties.

The important property of phthalocyanine compounds is their solubility determining many fields of their application. Not substituted phthalocyanines have almost no solubility in common organic solvents. Introduction of substituents into peripheral and non-peripheral positions of phthalocyanine macrocycle forms additional solvation centers and impart the solubility [14–16]. Obtainment of phthalocyanines soluble in water mediums is important from the point of green chemistry processes and

technology. Introduction of sulfo- or carbon acid fragments into annulated benzene rings of phthalocyanine macrocycle provides phthalocyanines soluble in water mediums obtainment. Here the question of regulation and sometimes suppression of metallophthalocyanines self-aggregation appears. Combination of various functional groups as parts of phthalocyanine macrocycle is a key to rule physical and chemical properties of phthalocyanine compounds [15].

Synthesis of cobalt and copper complexes of bifunctionally- and symmetrically substituted phthalocyanines and their analogues is presented in the work. Catalytic activity upon liquid-phase oxidation of sodium N,N-diethylcarbamdithiolate under mild conditions is studied for water-soluble cobalt complexes in order to find out interrelationship between terminal fragment structure of phthalocyanines and their catalytic activity.

## 2. Experimental

### 2.1. Reagents

Solvents used in the work N,N-dimethylformamide (DMF), 2-propanol, acetone, chloroform were purified and stored in accordance to recommendations [17]. Inorganic salts applied for

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