

SYNTHESIS OF POLYPYRROLE POWDERS BY ELECTROCHEMICAL METHOD

Olga Istakova^{a,b}, Dmitry Konev^{a,b}, Tatyana Medvedeva^d, and Mikhail Vorotyntsev^{a,b,c,d}

^a Institute for Problems of Chemical Physics, Russian Academy of Sciences,
142432 Chernogolovka, Russia

^b D. I. Mendeleev University of Chemical Technology of Russia, 125047 Moscow,
Russia

^c Institute de Chimie Moléculaire de l'Université de Bourgogne, 21078 Dijon, France

^d M. V. Lomonosov Moscow State University, 119991 Moscow, Russia

At present, methods of synthesis of conjugated poly- and oligomeric systems concerning the oxidation of monomers, aromatic and heteroaromatic compounds, are known and most widely used [1]. There are two conventional routines most frequently applied: electrochemical oxidation of the monomer on surface of electrode with formation of a film or reagent oxidation in a solution with oligo / polymer deposition of a polymer as a powder. The disadvantage of first method is formation of intermolecular bonds inside film, which makes thus synthesized material insoluble. The product of second method can be dissolved in a suitable solvent, but it usually contaminated by monomer or oxidizer residues or products of its reduction and requires further purification.

In the present study we have investigated an approach that combines important advantages of electrochemical method (such as variation within a wide range and with high accuracy of oxidation potential, direct control of rate and total amount of desired product, a wide choice of doping ion type and polymerization medium, absence of additional chemical agents) with possibility to obtain a molecular product without crosslinks, i.e. suitable for subsequent processing. Electrooxidation of pyrrole in an acetonitrile solution of background electrolyte was carried out on a porous electrode with simultaneous pumping of polymerization medium through pores of electrode. The effect of pumping parameters, electropolymerization regime, and monomer concentration on polymer yield has been investigated. It has been found that the result of polymerization is polypyrrole, which partially formed inside the solution phase as a colloid and partially filled pores of carbon paper in the form of a polymer film on its fibers. The resulting polypyrrole was analyzed by electrochemical and spectral methods.

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[1] T.A. Skotheim, J. Reynolds. Handbook of Conducting Polymers, 2 Volume Set. – CRC press, 2007.