Conducting Polymers: On The Threshold of Commercialization

The discovery, over two decades ago, of relatively high electrical conductivity (~10^{+3} S/cm) of doped polyacetylene[1] sparked extensive research in the application of conjugated polymers in such diverse fields as electronics, energy storage, catalysis, chemical sensing, biochemistry, and corrosion control.[2,3] However, the conducting polymers were found to be unstable in air and difficult to process. Significant advances in improving the desired electrical, electronic, optical, and mechanical properties, while simultaneously enhancing processability and stability, have been realized by cross-disciplinary collaborations between chemists, physicists, materials scientists, and engineers.

As you move forward with applications development,[4] we invite you to come to Aldrich for all your conducting polymer needs. Listed below are products from some of the extensively researched classes of conducting polymers. In addition, we offer other conducting polymers as well as a wide selection of monomers, conducting polymer precursors, and dopants. If you have questions or comments about these products or other **Monomers, Polymers, and Additives** from Aldrich, please contact our Technical Services Department at **(800) 231-8327** (USA), or via **e-mail** at **aldrich@sial.com**.

Polyaniline

Polyaniline is becoming the conducting polymer of choice in many applications for several reasons: its electronic properties are readily customized, it exhibits excellent chemical stability, and is the most inexpensive of the conducting polymers.

47,670-6	**Polyaniline (emeraldine base)**	**10g; 50g**
42,832-9	**Polyaniline (emeraldine salt)**	**5g ; 25g**

Polypyrrole

48,255-2	**Polypyrrole,** doped, 5 wt. % solution in water	**100mL**
48,110-6	**Polypyrrole,** polymer-supported, doped (ConQuest® 1020)	**5g ; 20g**
48,111-4	**Polypyrrole,** polymer-supported, undoped (ConQuest® 1010)	**5g; 20g**
48,109-2	**Polypyrrole,** polymer-supported, doped, 20 wt. % dispersion in water (ConQuest® XP1000)	**10mL ;100mL**

ConQuest is a registered trademark of DSM N.V.

Polythiophene

Polythiophenes have been studied extensively for use in light-emitting diodes, among other applications, due to the chemical variability offered by substitution at the 3- and 4- positions. The regularity of the side-chain incorporation strongly affects the electronic band gap of the conjugated main chain and is critical to device performance.[5] Aldrich offers highly regiocontrolled alkyl-substituted polythiophenes (P3AT): almost completely regioregular head-to-tail (HT) P3AT and regiorandom (1:1 HT/HH) P3AT.[6]

	Regioregular (>98.5% HT)		Regiorandom (HT/HH = 1:1)	
Poly(3-butylthiophene-2,5-diyl)	49,533-6	**1g**	51,142-0	**1g**
Poly(3-hexylthiophene-2,5-diyl)	44,570-3	**1g**	51,082-3	**1g**
Poly(3-octylthiophene-2,5-diyl)	44,571-1	**1g**	51,083-1	**1g**
Poly(3-decylthiophene-2,5-diyl)	49,534-4	**1g**	51,085-8	**1g**
Poly(3-dodecylthiophene-2,5-diyl)	45,065-0	**1g**	51,086-6	**1g**

References: (1) Chiang, C.K. et al. *Phys. Rev. Lett.* **1977**, *39*, 1098. (2) Liu, G.; Freund, M.S. *Macromolecules* **1997**, *30*, 5660, and references therein. (3) Jasty, S.; Epstein; A.J. *Polym. Mater. Sci. Eng.* **1995**, *72*, 565, and references therein. (4) *Conductive Polymers: Ease of Processing Spearheads Commercial Success*, Savage, Peter, Ed.; Technical Insights, Inc./John Wiley & Sons: Englewood, NJ, 1998; 89pp. For more information, call 800-245-6217 (USA) or 201-568-4744. (5) Berggren, M. et al. *Nature* **1994,** *372*, 444. (6) For characterization and solid-state properties, see Chen, T-A. et al. *J. Am. Chem. Soc.* **1995**, *117,* 233.