

Introduction

The organic polymers, polyacetylene, $(CH)_x$, poly(p-phenylene), $(C_6H_4)_x$ and polyaniline, $[\{-C_6H_4\}-N(H)-\{C_6H_4\}-N(H)-\{C_6H_4\}-N=C_6H_4=N-]_x$ can all be "doped" to the metallic regime chemically and/or electrochemically. Polyacetylene, frequently referred to as the "prototype conducting polymer", has been very extensively studied during the last eight years since its novel properties were first discovered. Shortly after this discovery it was found that poly(p-phenylene) could likewise be doped to the metallic regime. Polyaniline has been known for approximately 150 years but only during the past two years has an active interest been taken in the different forms in which it can exist and the fact that, unlike all other conducting polymers, it can be doped to the metallic conducting regime by relatively dilute aqueous solutions of non-oxidizing protonic acids. It has also been found that poly(p-phenylenevinylene), $\{(C_6H_4)-CH=CH-\}_x$, which can be regarded as a hybrid between polyacetylene and poly(p-phenylene) can also be doped to the metallic regime. With the exception of polyaniline the term "doping" refers to the partial oxidation or reduction of the pi system of the polymer which is accompanied by a very large increase in electronic conductivity. In the case of the emeraldine base form of polyaniline it appears that doping involves a simple acid-base interaction to form a salt.

In principle, some or all of the hydrogen atoms in all the above polymers can be replaced in whole or in part by a wide variety of organic, organometallic or inorganic groups to give a vast number of new polymers, at least some of which might have their conductivity greatly increased by doping. A few derivatives of this type have already been synthesized. The polymers containing a (C_6H_4) ring in which the substitution is not in the para position can in principle be prepared and some species of this type have been synthesized. The three title compounds represent three basically different types of conducting polymers; those consisting of an aliphatic backbone; those consisting of an aromatic backbone and those consisting