Environmental stability of the chemical structure

Singlet Oxygen Sensitization Via the polymer
Triplet state

Polymer


Formation of carbonyl groups

Chemical defects = dissociation centers, traps

Oxygen, Carbonyls and Inner Structure

Intercepting the oxidation

Environmental stability of electronic conductivity (doping)

Instability of $N$ type towards oxygen (or tendency of intrinsic to become $P$ type)

\[
O_2 + 4H^+ + 4e^- \rightarrow 2H_2O \quad E = -V_1
\]

\[
2\text{Pol}^0 + 2e^- \leftrightarrow 2\text{Pol}^- \quad E = -V_2
\]

Instability of $N$ type towards water (or tendency of intrinsic to become $P$ type)

\[
2H_2O + 2e^- \leftrightarrow H_2 + 2OH^- \quad E = -V_3
\]

\[
2\text{Pol}^0 + 2e^- \leftrightarrow 2\text{Pol}^- \quad E = -V_2
\]

\[
2\text{Pol}^- + 2H_2O \leftrightarrow 2\text{Pol}^0 + H_2 + 2OH^- \quad E = -V_3 -(-V_2)
\]

The value of $V_2$ depends on the specific polymer however, for most (all?) polymers it is such that $N$ type is not chemically stable. $\Rightarrow$ Encapsulate devices. [a dense material that does not allow penetration (diffusion) of oxygen and water will show better stability but probably still require encapsulation to be truly stable]