SUMMARY ~~OF THE INVENTION~~

In an ~~aspect~~ embodiment of the invention, there is an article comprising:

a substrate comprising a first surface and a second surface, the second surface in contact with an outside environment.

wherein the substrate comprises a polymer comprising poly(trimethylene furandicarboxylate) (PTF), and

wherein the polymer provides an improvement of 2-99% in oxygen and an improvement of 11-99% or 50-98% or 75-96% in carbon dioxide and an improvement of 3-99% and 25-75% in water vapor gas barrier properties of the substrate as compared to a substrate consisting made of nascent poly(ethylene terephthalate) (PET).

In one aspect of the invention, there is provided an article comprising: a substrate comprising a first surface and a second surface, the second surface in contact with an outside environment; wherein the substrate comprises a polymer comprising poly(trimethylene furandicarboxylate) (PTF), and wherein the polymer provides an improvement in gas barrier properties of the substrate as compared to a substrate consisting of nascent poly(ethylene terephthalate) (PET), wherein the improvement for oxygen is in the range of 2–99%, an improvement for carbon dioxide is in the range of 11–99%, and an improvement for moisture is in the range of 3–99%.

In an embodiment, the polymer is a polymer blend comprising PTF and poly (alkylene terephthalate) (PAT) and wherein the polymer blend comprises 0.1–99.9% by weight of PTF based on the total weight of the polymer blend.

In an embodiment, the polymer is a polymer blend comprising PTF and poly (alkylene furandicarboxylate) (PAF) and wherein the blend comprises 0.1–99.9% by weight of PTF based on the total weight of the polymer blend.

In an embodiment, the polymer is a copolymer comprising units derived from 2,5-furandicarboxylate, terephthalate, and 1,3 propane diol monomer units., and wherein the copolymer comprises 0.1–99.9% by weight of PTF

repeat units based on the total weight of the copolymer.

In another embodiment, the substrate comprises a polymer disposed in between and in contact with a first layer and a second layer, wherein the first layer is in contact with the first surface of the substrate and the second layer is in contact with the second surface of the substrate, wherein the polymer comprises poly(trimethylene furandicarboxylate) (PTF), and wherein the amount of polymer is in the range of 0.1−99.9% or 5-75% or 10-50% by weight based on the total weight of the first layer, polymer, and the second layer.

In another embodiment, the substrate is in a form of a housing provided