Claims

1. A ~~thick walled~~ hollow fiber filter ~~element~~ comprising:

a housing; and

a hollow fiber filter element disposed within the housing, the hollow fiber filter element comprising:

a first end, ~~and~~ a second end, an exterior circumferential porous wall extending between the first and second ends, ~~and~~ a lumen running therethrough, ~~said~~ the lumen open to the first and second ends, a central longitudinal axis extending between the first and second ends, and a length as measured between the first and second ends along the central longitudinal axis, the hollow fiber filter element characterized by a throughput volume defined as a measurement of a flow of particles passing through the exterior circumferential porous wall;

a watertight seal disposed about an exterior surface of each of the first and second ends between the exterior surface of each of the first and second ends and the housing; and

a non-permeable covering selected from one or more of a dip coat, a spray coat, and a shrink wrap, the non-permeable covering disposed about a first portion of ~~an exterior surface of~~ the ~~thick~~ porous wall~~ed~~ of the hollow fiber filter element, the~~said~~ non-permeable covering extending from the watertight seal of the ~~a region proximate the~~ first end toward the second end along a length of the central longitudinal axis,

wherein the~~said~~ non-permeable covering extends circumferentially about the exterior circumferential ~~thick~~ porous wall~~ed~~ of the hollow fiber filter element, and

wherein a second portion of the exterior circumferential porous wall ~~surface~~ of the ~~thick walled~~ hollow fiber filter element is not covered by the non-permeable covering, and

wherein application of the non-permeable covering reduces the throughput volume of the hollow fiber filter element by reducing an effective overall length of the hollow fiber filter element.

~~2. The thick walled hollow fiber filter element of claim 1, further comprising~~

~~a water tight seal disposed about the exterior surface of each of the first and second ends between said exterior surface and a housing enclosing said thick walled hollow fiber filter element, wherein the non-permeable covering is proximate to the water tight seal at the first end.~~

~~3.~~2. The ~~thick walled~~ hollow fiber filter ~~element~~ of claim 1, wherein a third portion of the porous wall is covered by the non-permeable covering, the third portion positioned between the second

portion of the porous wall and the watertight seal of the second end of the ~~is also disposed about the exterior of the thick walled~~ hollow fiber filter element~~proximate to the second end~~.

~~4.~~3. The ~~thick walled~~ hollow fiber filter ~~element~~ of claim 2~~3~~, wherein the covering comprises polyurethane.

~~5.~~4. The ~~thick walled~~ hollow fiber filter ~~element~~ of claim 3~~4~~, wherein the water tight seal comprises polyurethane.

~~6. A method of scaling a filtration process utilizing a thick walled hollow fiber filter element of claim 1, the method comprising:~~

~~selecting a first thick walled hollow fiber filter element characterized by a first exterior surface area that is not covered by the covering and a first throughput volume;~~

~~selecting a second throughput volume and determining a ratio between the first and second throughput volumes; and~~

~~selecting a second thick walled hollow fiber element characterized by a second exterior surface area that is equal to the first exterior surface area divided by the ratio.~~

~~7. The method of scaling a filtration process of claim 4, wherein the first volume is greater than the second volume.~~

~~8. The method of scaling a filtration process of claim 4, wherein the first volume is less than the second volume.~~

~~9. The method of scaling a filtration process of claim 4, wherein the covering is one or more of the following: dip coat, spray coat, and shrink wrap.~~

~~10. The method of claim 4, wherein the thick walled hollow fiber element further comprises a water tight seal disposed about the exterior surface of each of the first and second ends between said exterior surface and a housing enclosing said thick walled hollow fiber filter element, wherein the non-permeable covering is proximate to the water tight seal at the first end.~~

~~11. The method of claim 4, wherein the non-permeable covering is also disposed about the exterior of the thick walled hollow fiber filter proximate to the second end.~~

~~12. A scalable filtration system utilizing the thick walled hollow fiber filter elements of claim 1, the system comprising:~~

~~a plurality of thick walled hollow fiber filter elements of identical composition, inner diameter, and wall thickness, but differing in the exterior surface area not covered by the covering,~~

~~wherein for any two thick walled hollow fiber filter elements of the plurality, a ratio of the process volume capacity of the thick walled hollow fiber filter elements is equal to a ratio of the exterior surface areas not covered by the covering~~