CLAIMS

What is claimed is:

1. A module, comprising:

at least two individual flat ceramic segments comprising rows of channels with more than one channel per row;

potting material holding the at least two individual flat ceramic segments together; and

a housing holding the at least two individual flat ceramic segments and the potting material,

wherein:

the housing, potting material and at least two individual flat segments define a filtration module; ~~and~~

the module is configured to be capable of providing a design independent pressure decay of less than 36 mBar * liters / m² * min when measured according to the following test method:

wetting the ceramic and completely removing entrained air;

applying air at a pressure of 1 bar to a port of the housing; and

turning off the air supply to the port and measuring the design independent pressure decay in the channels at a temperature of 25°C~~.~~; and

the module is made by a process comprising:

drying extruded green bodies on a flat porous support having a porosity of greater than 20%, preferably having a porosity of greater than 50% or preferably having a porosity of 60% - 95% when compressed with a force of 2.45 x 10^{-5} kN/cm^2, wherein drying the extruded green bodies provides individual segments;

categorizing the individual segments of the at least two individual flat ceramic segments into at least two categories based on occurrence of defects that affect field performance, where categorizing the segments occurs before assembly of the segments, each of the segments extending from a first end to a second end;

assembling the individual segments primarily from one category of the at least two categories and forming assembled segments;

potting the assembled segments together; and

disposing the potted segments into a housing with at least two ports, at least one first port is a fluid treatment entry port, at least one second port is a treated fluid delivery port.

2. The module of claim 1, wherein the module is configured to be capable of providing a design independent pressure decay of less than 18 mBar * liters / m² * min, preferably less than 9.1 mBar * liters / m² * min or preferably less than 4.5 mBar * liters / m² * min according to the test method.

3. A monolithic filtration module comprising a plurality of separate ceramic segments held in a housing via a potting material, wherein:

the module is configured to be capable of providing a design independent pressure decay of less than 36 mBar * liters / m² * min when measured according to the following method:

wetting the ceramic and completely removing entrained air;

applying air at a pressure of 1 bar to a port of the housing; and

turning off the air supply to the port and measuring the design independent pressure decay in the channels at a temperature of 25°C.; and

the module is made by a process comprising:

drying extruded green bodies on a flat porous support having a porosity of greater than 20%, preferably having a porosity of greater than 50% or preferably having a porosity of 60% - 95% when compressed with a force of 2.45 x 10^{-5} kN/cm^2, wherein drying the extruded green bodies provides individual segments;

categorizing the individual segments of the plurality of separate ceramic segments into at least two categories based on occurrence of defects that affect field performance, where categorizing the segments occurs before assembly of the segments, each of the segments extending from a first end to a second end;

assembling the individual segments primarily from one category of the at least two categories and forming assembled segments;

potting the assembled segments together; and

disposing the potted segments into a housing with at least two ports, at least one first port is a fluid treatment entry port, at least one second port is a treated fluid delivery port.

4. A module, comprising:

at least two individual flat ceramic segments comprising rows of channels with more than one channel per row;

potting material holding the at least two individual flat ceramic segments together; and

a housing holding the at least two individual flat ceramic segments and the potting material,

wherein:

the housing, potting material and at least two individual flat segments define a filtration module; ~~and~~

the module is configured to be capable of providing a design independent pressure decay of less than 36 mBar * liters / m^2 * min when measured according to the following method:

wetting the segments;

applying air to the channels at a pressure of above 0.1 bar when an outside portion of the segments is open to atmospheric conditions;

stopping air supply to the channels; and

measuring the design independent pressure decay through the segments at a temperature of 25°C~~.~~; and

the module is made by a process comprising:

drying extruded green bodies on a flat porous support having a porosity of greater than 20%, preferably having a porosity of greater than 50% or preferably having a porosity of 60% - 95% when compressed with a force of 2.45 x 10^{-5} kN/cm^2, wherein drying the extruded green bodies provides individual segments;

categorizing the individual segments of the at least two individual flat ceramic segments into at least two categories based on occurrence of defects that affect field performance, where categorizing the segments occurs before assembly of the segments, each of the segments extending from a first end to a second end;

assembling the individual segments primarily from one category of the at least two categories and forming assembled segments;

potting the assembled segments together; and

disposing the potted segments into a housing with at least two ports, at least one first port is a fluid treatment entry port, at least one second port is a treated fluid delivery port.

5. The module of claim 3 or 4, wherein the module is configured to be capable of providing a design independent pressure decay of less than 18 mBar * liters / m^2 * min, preferably less than 9.1 mBar * liters / m^2 * min or preferably less than 4.5 mBar * liters / m^2 * min.

6. The module of claim 4 or 5, wherein the method includes applying air to the channels at a pressure of above 0.5 bar, preferably above 0.75 bar or preferably above 1.0 bar when an outside portion of the segments is open to atmospheric conditions.

7. A monolithic filtration module comprising a plurality of separate ceramic segments held in a housing via a potting material, wherein:

the module is configured to be capable of providing a design independent pressure decay of less than 36 mBar * liters / m^2 * min when measured according to the following method:

wetting the segments;

applying air to the channels at a pressure of above 0.1 bar when an outside portion of the segments is open to atmospheric conditions;

stopping air supply to the channels; and

measuring the design independent pressure decay through the segments at a temperature of 25°C.; and

the module is made by a process comprising:

drying extruded green bodies on a flat porous support having a porosity of greater than 20%, preferably having a porosity of greater than 50% or preferably having a porosity of 60% - 95% when compressed with a force of 2.45 x 10^{-5} kN/cm^2, wherein drying the extruded green bodies provides individual segments;

categorizing the individual segments of the plurality of separate ceramic segments into at least two categories based on occurrence of defects that affect field performance, where categorizing the segments occurs before assembly of the segments, each of the segments extending from a first end to a second end;

assembling the individual segments primarily from one category of the at least two categories and forming assembled segments;

potting the assembled segments together; and

disposing the potted segments into a housing with at least two ports, at least one first port is a fluid treatment entry port, at least one second port is a treated fluid delivery port.

8. The module of claim 7, wherein the module is configured to be capable of providing a design independent pressure decay of less than 18 mBar * liters / m² * min, preferably less than 9.1 mBar * liters / m² * min or preferably less than 4.5 mBar * liters / m² * min.

9. The module of claim 7 or 8, wherein the method includes applying air to the channels at a pressure of above 0.5 bar, preferably above 0.75 bar or preferably above 1.0 bar when an outside portion of the segments is open to atmospheric conditions.

~~10. The module of any of claims 1 to 9, wherein the ceramic segments are made by a process comprising:~~

~~categorizing individual segments of the ceramic segments into at least two categories based on occurrence of defects that affect field performance, where categorizing the segments occurs before assembly of the segments, each of the segments extending from a first end to a second end;~~

~~assembling the individual segments primarily from one category of the at least two categories and forming assembled segments;~~

~~potting the assembled segments together; and~~

~~disposing the potted segments into a housing with at least two ports, at least one first port is a fluid treatment entry port, at least one second port is a treated fluid delivery port.~~

~~11~~10. The module of any of claims ~~10~~1 to 9, wherein the process of making the ~~ceramic segments~~module further comprises testing the individual segments prior to categorizing the individual segments.

~~12~~11. The module of claim ~~11~~10, wherein testing the individual segments includes wetting the segments, applying air to the channels at a pressure of above 0.1 bar to the channels, the outside portion of the segments is open to atmospheric conditions, stopping air supply to the channels, and measuring a rate of pressure decay in the channels.

~~13~~12. The module of any of claims 1~~0~~ to ~~12~~11, wherein the individual segments are categorized based on a design independent pressure decay of less than 36 mBar * liters / m² * min at a temperature of 25°C, preferably less than 18 mBar * liters / m² * min at a temperature of 25°C, preferably less than 9.1 mBar * liters / m² * min at a temperature of 25°C or preferably less than 4.5 mBar * liters / m² * min at a temperature of 25°C.

~~14~~13. The module of any of claims ~~11~~ 10 to ~~13~~12, wherein testing the individual segments includes wetting the segments, applying air to the channels at a pressure of above 0.1 bar to the first end of the segments, the outside portion of the segments is open to atmospheric conditions, and measuring a gas flow rate in the channels.

~~15~~14. The module of any of claims ~~11~~ 10 to ~~14~~13, wherein testing the individual segments includes wetting the segments, immersing the segment in a test liquid, applying air to the channels, and verifying an absence of air passage at a pressure equal or greater than 0.1 Bar.

~~16~~15. The module of claim ~~15~~14, wherein the individual segments are categorized based on the presence or absence of air passage at a pressure equal or greater than .5 Bar, preferably equal or greater than .7 Bar or preferably equal or greater than .9 – 1.1 Bar.

~~17. The module of any of claims 10 to 16, wherein the process of making the ceramic segments further comprises drying the individual segments on a flat porous support having a porosity of greater than 20%, preferably having a porosity of greater than 50% or preferably having a porosity of 60% - 95% when compressed with a force of 2.45 x 10^{-5} kN/cm^2.~~

~~18~~16. The module of any of claims 1~~0~~ to ~~17~~15, wherein the process of making the ~~ceramic segments~~module further comprises drying the extruded green bodies~~individual segments~~ on a flat porous support by removing water to below 3% moisture.

~~19. A ceramic filtration module comprising:~~

~~two or more individual flat segments, the two or more individual flat segments having more than one row of channels and more than one channel per row;~~

~~potting material disposed around the two or more individual flat segments, the potting material holding the two or more individual flat segments together; and~~

~~a housing holding the two or more individual flat segments and the potting material, the two or more individual flat segments and the potting material disposed within the housing;~~

~~the housing having at least two ports, at least one first port is a fluid treatment entry port, at least one second port is a treated fluid delivery port; and~~

~~wherein the module has a design independent pressure decay of less than 36 mBar * liters / m² * min measured at a temperature of 25°C when subjected to a test comprising:~~

~~wetting the ceramic and completely removing entrained air;~~

~~applying air at a pressure of 1 bar to either the at least one first or the at least one second port with the other port open to atmosphere; and~~

~~turning off the air supply to the port and measuring the rate of pressure decay.~~

~~20. The module of claim 19, wherein the design independent pressure decay is pressure decay is less than 18 mBar * liters / m² * min, preferably less than 9.1 mBar * liters / m² * min or preferably less than 4.5 mBar * liters / m² * min.~~

~~21~~17. A ceramic filtration module comprising;

two or more individual flat segments, the two or more individual flat segments having more than one row of channels and more than one channel per row, the two or more individual flat segments formed from green extruded bodies dried on a flat porous support, the flat porous support having a porosity greater than porosity of greater than 20% when compressed with a force of 2.45 x 10^{-5} kN/cm^2;

potting material disposed around the two or more individual flat segments, the potting material holding the two or more individual flat segments together;

a housing holding the two or more individual flat segments and the potting material, the two or more individual flat segments and the potting material disposed within the housing;

the housing having at least two ports, at least one first port is a fluid treatment entry port, at least one second port is a treated fluid delivery port; and

wherein the module has a design independent pressure decay of less than 36 mBar * liters / m² * min measured at a temperature of 25°C when subjected to a test comprising:

wetting the ceramic and completely removing entrained air;

applying air at a pressure of 1 bar to either the at least one first or the at least one second port with the other port open to atmosphere; and

turning off the air supply to the port and measuring the rate of pressure decay.

~~22~~18. The module of claim ~~21~~17, wherein the design independent pressure decay is less than 18 mBar * liters / m^2 * min, preferably less than 9.1 mBar * liters / m^2 * min or preferably less than 4.5 mBar * liters / m^2 * min.

~~23~~19. The module of claim ~~21~~17, wherein the two or more flat segments are made by a process comprising:

extruding one or more green bodies; and

drying of the green extruded bodies on a flat porous support to provide the two or more flat segments, the flat porous support having a porosity greater than 20% when compressed with a force of 2.45 x 10^{-5} kN/cm^2.

~~24~~20. The module of claim ~~23~~19, wherein the process of making the two or more flat segments further comprises drying the one or more green bodies on a flat porous support by removing water to below 3% moisture.

~~25~~21. The module of claim ~~23~~ 19 or ~~24~~20, wherein the flat porous support having a porosity greater than 50% or preferably having a porosity between 60% - 95% when compressed with a force of 2.45 x 10-5 kN/cm^2.