

cellent film strength suitable for plant cultivation can be achieved by causing a PVA film to have a loss tangent ($\tan \delta$) in the range of from 0.005 to 0.2 as measured in an equilibrium swollen state in water at 30 °C. Based on these findings, the present invention has been completed.

[0012] More specifically, the present invention provides the following.

1) A plant cultivation system comprising:

a polyvinyl alcohol (PVA) film for cultivating a plant thereon, and

a nutrient fluid retaining means disposed to be in contact with the lower surface of the PVA film, and

a feeding means for feeding a nutrient fluid to a position below the PVA film,

wherein the PVA film has an equilibrium degree of swelling in the range of from 125 to 250 % as measured in water at 30 °C and has a loss tangent ($\tan \delta$) in the range of from 0.005 to 0.2 as measured in an equilibrium swollen state in water at 30 °C.

2) The plant cultivation system according to item 1 above, wherein the PVA film is a biaxially oriented PVA film.

7) A method for cultivating a plant, which comprises:

(1) providing a plant cultivation system comprising:

a PVA film for cultivating a plant thereon, and

a nutrient fluid retaining means disposed to be in

5 contact with the lower surface of the PVA film, ~~and~~

~~—— a feeding means for feeding a nutrient fluid to a
position below the PVA film,~~

wherein the PVA film has an equilibrium degree of

swelling in the range of from 125 to 250 % as measured

10 in water at 30 °C and has a loss tangent ($\tan \delta$) in the

range of from 0.005 to 0.2 as measured in an equilibri-

um swollen state in water at 30 °C,

(2) placing a plant on the PVA film of the plant culti-
vation system, and

15 (3) causing ~~the~~ a nutrient fluid to be in contact with
the plant through the PVA film, thereby cultivating the plant
on the PVA film.

Effects of the Invention

20 [0013] By performing plant cultivation using the plant cul-
tivation system of the present invention employing a PVA film
having not only excellent absorption and perme-

a PVA film (F-5; thickness: 70 μm). The equilibrium degree of swelling of the PVA film as measured in water at 30 °C was determined in substantially the same manner as in Example 1 and found to be 200 %.

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[0094] Comparative Example 2 (F-6)

A PVA film ~~having thickness: 50 μm~~ was obtained in substantially the same manner as in Comparative Example 1, except that the rate at which the film was formed was changed
10 to 12 m/min. The PVA film having a thickness of 60 μm was dried at 200 °C for 60 seconds, thereby obtaining a heat-treated film (F-6; thickness: 60 μm). The equilibrium degree of swelling of the PVA film as measured in water at 30 °C was determined in substantially the same manner as in Example 1
15 and found to be 127 %.

[0095] Comparative Example 3 (F-7)

Using a constant volume pump, an aqueous solution of polyvinyl alcohol obtained by dissolving 40 parts of a PVA
20 (average saponification degree: 99.7 mol %; average polymerization degree: 1,700; 4 % aqueous solution viscosity as measured at 25 °C: 40 mPa·s; sodium acetate content: 0.3 %) in 60 parts of water was fed to a twin-screw kneading extruder (screw L/D ratio = 40) having a jacket temperature of 60 to
25 150 °C to perform an extru-

[0096] Comparative Example 4 (F-8)

With respect to "imec film" (thickness: 65 μm) manufactured and sold by Mebiol Inc., the equilibrium degree of swelling thereof as measured in water at 30 °C was determined in substantially the same manner as in Example 1 and found to be 148 %.

[0097] Comparative Example 5 (F-9)

With respect to "imec film 2" (thickness: 60 μm) manufactured and sold by Mebiol Inc., the equilibrium degree of swelling thereof as measured in water at 30 °C was determined in substantially in the same manner as in Example 1 and found to be 153 %.

[0098] Example 6-5 (Measurement of dynamic viscoelasticity)

The film samples (F-1) to (F-9) of Examples 1 to 4 and Comparative Examples 1 to 5 were individually immersed in water at 30 °C for 30 minutes, and a circular film having a diameter of 4 cm was cut out from each film sample. The circular films were individually subjected to measurement of dynamic viscoelastic behavior by means of a stress control type viscoelastic measuring apparatus (rheometer AR-500, manufactured and sold by TA Instruments Japan Inc.).

that no slip occurs among the PVA film, the measurement device and the measurement stage, and that the film not be compressed. The temperature of the measurement stage was set at 30 °C, and the dynamic viscoelasticity was measured at a measuring frequency of 1 Hz under conditions such that the stress and displacement were in a linear region. The results of each sample were summarized in Table 1 below for comparison.

10 [0101] Example 7-6 (Root penetration test)

600 ml of a nutrient fluid (Otsuka House A prescription EC = 2, manufactured and sold by Otsuka Chemical Co., Ltd.) was placed in a styrene resin tray (lengthwise size: 19.5 cm × transverse size: 12.5 cm × depthwise size: 5.5 cm). Each of PVA films of A4 size produced in Examples and Comparative Examples was individually disposed on the nutrient fluid so that one surface of the film was positioned in contact with the nutrient fluid. Coconut shell chips were placed in an amount of 50 g per 1 m² on the PVA film to form a soil having a thickness of 1.5 cm, and lawn grass seeds (Western lawn called "perennial ryegrass accent", manufactured and sold by Snow Brand Seed Co., Ltd.) were seeded thereto. The seeds were sufficiently watered by spraying water with a sprayer, and the whole of the re

film.

[0102]

Table 1

	Thickness of film (μm)	Loss tangent ($\tan \delta$) (G'' / G')	Equilibrium degree of swelling in water at 30° C	Number of days until root pene- tration
Example 1 (F-1)	30	0.072	184 %	○ (150 days or more)
Example 2 (F-2)	40	0.060	183 %	○ (150 days or more)
Example 3 (F-3)	30	0.044	152 %	○ (150 days or more)
Example 4 (F-4)	40	0.037	149 %	○ (150 days or more)
Comparative Example 1 (F-5)	70	0.234	200 %	× (59 days)
Comparative Example 2 (F-6)	60	0.220	127 %	× (22 days)
Comparative Example 3 (F-7)	25	0.048	118 %	—
Comparative Example 4 (F-8)	65	0.341	148 %	× (38 days)
Comparative Example 5 (F-9)	60	0.350	153 %	ex (59 days)

5 [0103] In Examples 1 to 4, the plant growth was good, the plant roots well spread and adhered to the PVA film, and the occurrence of root penetration through the PVA film was prevented for a period of 150 days or more. On the other hand, in Comparative Example 3, the PVA film

CLAIMS

1. A plant cultivation system comprising:

a polyvinyl alcohol (PVA) film for cultivating a
5 plant thereon, and

a nutrient fluid retaining means disposed to be in
contact with the lower surface of the PVA film, ~~and~~

~~— a feeding means for feeding a nutrient fluid to a
position below the PVA film,~~

10 wherein said PVA film has an equilibrium degree of
swelling in the range of from 125 to 250 % as measured
in water at 30 °C and has a loss tangent ($\tan \delta$) in the
range of from 0.005 to 0.2 as measured in an equilibrium
swollen state in water at 30 °C.

15 2. The plant cultivation system according to claim 1,
wherein said PVA film is a biaxially oriented PVA film.

3. The plant cultivation system according to claim 1
20 or 2, wherein said PVA film has a dry thickness of from
5 to 100 μm .

4. The plant cultivation system according to any one
of claims 1 to 3, wherein said nutrient fluid retaining
25 means is a hydroponic tank accommodating a nutrient flu

id which is disposed to be in contact with the lower surface of the PVA film.

5. The plant cultivation system according to any one of
5 claims 1 to 3, wherein said nutrient fluid retaining means is a material having a water impermeable surface on or above which said PVA film is disposed, and

wherein said plant cultivation system further comprises a nutrient fluid feeding means for continuously or intermit-
10 tently feeding a nutrient fluid to a position between said PVA film and said nutrient fluid retaining means.

6. The plant cultivation system according to claim 5, wherein said nutrient fluid feeding means comprises a drip
15 irrigation tube disposed between said PVA film and said nutrient fluid retaining means.

7. A method for cultivating a plant, which comprises:

(1) providing a plant cultivation system comprising:
20 a PVA film for cultivating a plant thereon, and
a nutrient fluid retaining means disposed to be in contact with the lower surface of the PVA film, ~~and~~

~~— a feeding means for feeding a nutrient fluid to a position below the PVA film,~~

wherein said PVA film has an equilibrium degree of swelling in the range of from 125 to 250 % as measured in water at 30 °C and has a loss tangent ($\tan \delta$) in the range of from 0.005 to 0.2 as measured in an equilibrium swollen state in water at 30 °C,

5 (2) placing a plant on the PVA film of said plant cultivation system, and
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(3) causing ~~the~~ a nutrient fluid to be in contact with the plant through said PVA film, thereby cultivating the plant on the PVA film.