



Instructions: 1g 1 wt% Pectin acid gel

Chemicals required:

0.01g Dried pectin

0.08g Glucono delta lactone (GDL) – acidifying agent, this hydrolyses over time releasing protons.

0.91ml MilliQ or other pure water source

Note:

To make a nice gel the GDL must be added in a liquid form. If the powder is added the gel will be full of bubbles and useless to run measurements on. Also, the GDL hydrolyses quickly so the solution can only be used about 2 minutes after it is made, any longer and the pH will be too low for the GDL solution and pectin solution to mix nicely.

Step 1: Dissolve the polymer in some of the water

Take 0.70ml of milliQ water and mix with the 0.01g of dried pectin at room temperature in an eppendorf tube. To initially wet the polymer one can shake the tube by hand, then heat to approximately 30C and shake gently overnight. This should produce a polymer solution that is completely dissolved. If the polymer is not completely dissolved use more heat and shaking until it is. Hand shaking for a short burst can really speed things along. Once the polymer is completely dissolved return the sample to room temperature for the rest of the steps.

Step 2: Make a GDL solution

Add the remaining 0.21ml of water to the 0.08g of GDL. Shake the GDL through the water, it should mostly dissolve rapidly with a few small crystals at the bottom. You have about 2 minutes to add this solution to the pectin solution

Step 3: Add the GDL solution to the pectin solution

Carefully add the GDL solution to the pectin solution at room temperature and try to minimise bubbles. Using a small mixing stick (spatula or something similar) try to evenly mix the two solutions without creating bubbles. The gel will start forming about 5 minutes after the GDL was added, so don't mix for too long. This solution can then be transferred into the equipment to run the measurement. Gelation will occur over approximately 2 hours, although samples should be left overnight to allow them to equilibrate.

RT 20°C
temp

Note on melting: These samples are very easy to melt, if one wants to run a measurement before and after melting the sample will form a relatively low viscosity fluid at about 60C. This can be achieved by immersing the sample in hot water for a minute or 2. The sample will quickly gel upon cooling.

Instructions: 2g 1 wt% pectin calcium control release gel $R = 0.4$ $R(\text{eff}) = 0.63$

Chemicals required:

0.02g dried pectin

0.0011g calcium carbonate

0.00197g GDL

1.977ml milliQ or other pure water

Note:

The GDL and calcium carbonate must be added in liquid form to prevent bubbles and to ensure no lumps of calcium carbonate.

Step 1: Dissolve the pectin in some of the water

Take 1.582ml of milliQ water and mix with the 0.02g of dried pectin at room temperature in an eppendorf tube. To initially wet the polymer one can shake the tube by hand, then heat to approximately 30C and shake gently overnight. This should produce a polymer solution that is completely dissolved. If the polymer is not completely dissolved use more heat and shaking till it is. Hand shaking for a short burst intermittently can really speed things along. Once the polymer is dissolved return the sample to room temperature for the following steps.

Step 2: Make a GDL and calcium carbonate solution

Add 0.00197g of GDL and 0.0011g calcium carbonate to 0.3954ml of water and carefully mix trying not to create bubbles. The GDL will quickly start hydrolysing so one must quickly move on to the next step, not longer than about 2 minutes.

Step 3: Mix the two solutions

The two solutions must be carefully mixed at room temperature to produce a nice homogenous gel. The mixing can be easily done using a small stirring stick like a small spatula. Add this to the measurement vessel and allow to gel over approximately 12 hours.

Note on melting: The calcium gel is harder to melt, although it will melt at approximately 80 degrees. Using the same hot water method as for the acid gel samples a measurement before and after melting can be made relatively easily.

0.002
0.00114

	①	②
Pectin	0.01013g	0.01996g
GDL	0.08004g	0.00199g
CaCO ₃		0.00108g

40°C 08.05.
10.00.

H₂O 0.70 1.582

Transfer & Cool.

Add salt solution.

70.12.

10.17.