Gelacell™ 3D Microfibrous Scaffold

Bringing cell culture to the next dimension

Product Description

Gelacell™ is a unique, 3D microfibrous scaffold specifically engineered for advanced in vitro 3D cell culture and tissue engineering applications. Designed as a non-woven, highly porous scaffold, Gelacell™ offers exceptional biocompatibility and non-toxicity across a variety of cell types. This product includes a 10 cm × 10 cm scaffold sheet that offers a 3D structure allowing cells to grow in a more physiologically relevant manner, promoting cell-cell interactions, tissue-like organization, and cell polarization, which are challenging to achieve in traditional 2D cell culture. The sheet can be used in its presented format or can be cut into desired shape and sizes depending on the user's experimental needs and setups. The scaffold is perfectly tailored for the cultivation of complex systems like cell microenvironments, tissue regeneration, and organoids, Gelacell™ also makes a robust platform for drug screening and other cell culture investigations. The optimized design of the scaffold ensures thermal, chemical, and mechanical stability, while also providing substantial swelling capabilities and porosity, allowing efficient nutrient diffusion and thereby preventing cellular waste build up.

Figure 1: Gelacell™ scaffold 10 cm × 10 cm ready to be used in its present format or can be cut into desired shape and sizes.

Product Features

- 3D architecture with a substantial available surface area.
- Minimal modifications required for transitioning from 2D to 3D culture.
- Stable mechanical properties.
- 10 cm × 10 cm scaffold can be cut into desired shape and sizes.
- Flexibility of scaffolds facilitates easy handleability.
- Porous structure promotes cell migration and efficient diffusion of nutrients, solutes, and gases.
- Compatibility with a variety of cell lines and culture conditions.
- Polymeric scaffolds: biocompatibility, diversity, and widely accepted in cellular applications.
- Sterilized by Gamma irradiation and remains sterile until the pack is opened.
- Storage at room temperature.

Product Datasheet

Product information	Gelacell™
Product code	GC0805RN-SC-C
Polymer	Poly-L-lactide (PLLA) (Pharmaceutical grade)
Appearance (dry)	White
Appearance (swelled in water/PBS)	White (Translucent)
Fiber orientation[1]	Randomly
Fiber diameter[1]	2.0 µm - 2.6 µm
Thickness	137 µm - 200 µm
Area density	4 g/m^2 - 5 g/m^2
Porosity[2]	≅ 90%
Wettability[3]	Hydrophilic The material uptakes water and compounds that dissolve in water due to the porosity and capillary forces wherever the material is soaked in a solution and incubated.
Absorptivity in PBS (pH 7.4 at 37°C)[4]	806% ± 66% The material was kept soaked for 24 hours in PBS at 37°C
Degradation (in PBS at 37°C)[4]	Negligible
pH (of PBS solution after 24 hours)[4]	7.4 – 7.5 without observable changes
%Elongation[5]	25% ± 2.78%
Modulus[5]	1046 kPa ± 157 kPa
Ultimate stress[5]	190 kPa ± 22 kPa

Note:

1. This information is derived from SEM images.
2. Porosity is determined by using the volumes of scaffolds and PLLA.
3. Wettability is determined by visual observation when water/PBS was added dropwise on top of the scaffolds after washing the scaffolds with 70% ethanol. Ethanol washing is highly recommended as PLLA is inherently hydrophobic in nature.
4. The degradation and absorptivity tests were performed gravimetrically in PBS solution. Absorptivity measures the uptake of solution and degradation indicates the decrease in weight over time while PBS was changed after every two days interval.
5. The tensile measurements were performed according to an in-house protocol and in a dry state.

Standard Operating Procedure

Gelacell unpacking and sterilizing

1. Adhering to aseptic techniques, place the Gelacell™ package under a laminar flow hood and carefully cut the boundaries of the sterile pouch and remove the scaffolds. Place the scaffolds in a suitable cell culture vessel for in vitro growth and maintenance of cells.
2. The production of Gelacell takes place in clean rooms ISO Class 7 conditions and the products are sterilized by Gamma irradiation. UV sterilization for 20 minutes is advisable to retain sterility of the product upon unpacking.

Note: The scaffold can be either used in its present format or it can be cut into desirable shape and sizes depending upon the experimental design and setups. It can also be used in a perfusion bioreactor. The scaffolds are expected to remain unchanged under standard UV-C radiation dosage. Higher irradiation doses should be used with caution.

Cell seeding and culture

1. Before cell seeding, wash the scaffold once with 70% ethanol, followed by a rinse with PBS solution three times.
2. Pre-swell the scaffold with your preferred cell culture media (with/without serum). Add a desirable amount of media onto the scaffold, incubate for 30 min to 1 hour, and aspirate the spent media.
3. Dispense your desired concentration of cell culture suspension with complete media onto the scaffold. The recommended cell seeding density ranges from 10^3 to 10^5 cells/cm^2, but the exact figure will depend on the cell type and the planned duration of cell culture.
4. Place the cell culture vessels in a CO2-incubator at 37°C for 0.5 - 2 hours to allow initial cell adhesion. Afterward, gently fill the vessels with the medium without dislodging the cells that have already adhered to the scaffold. Incubate for 24 hours to ensure complete cell adhesion to the scaffold.
5. [Optional] Evaluate cell adhesion under a microscope after incubation and increase the media volume to provide an appropriate medium for cell culture.
6. It's recommended to exchange media roughly every 48 hours; however, this may vary depending on the cell line, media, and cell density. Aspirate the waste media from the sides of the vessels and carefully add fresh media on top of the scaffold without dislodging the adhered cells. Continue media exchange throughout the cell culture period.

Note : The cell culture vessels refers to the container where the scaffolds are kept for culturing cells such as, petridish, multiwell plates, bioreactors, microfluidic devices, culture flask, etc. The rate and efficiency of cell attachment and detachment can be affected by temperature, pH, nutrient exchange, the concentration of cells, enzymatic degradation, and cell staining. The above guideline is the best known practices based on the tests carried out on the scaffolds. The cell seeding volume is preferred to be in between 10 to 70 µm to achieve total cell adhesion and avoid cell losses. However, this seeding volume is not restricted for lower (< 10^4) or higher (> 10^6) seeding density, except the performance of cell adhesion might differ.

Cell culture analysis

1. **[Optional] Cell fixation:** Rinse the scaffolds with PBS, and use 3.7% - 4% formaldehyde or paraformaldehyde for cell fixation. Leave the scaffolds in the solutions for 15 min at room temperature or in a CO2-incubator.
2. **For cell viability:** Use assay tests such as MTS, MTT, CCK-8, etc. Follow the standard protocols suggested by the manufacturer.
3. **For cell staining and imaging:** Use stains (e.g., calcein, FDA, phalloidin-conjugates, DAPI, propidium iodide) alone or in combination to achieve better contrast when imaged. Cells can be visualized either directly putting the cell culture vessels under microscope or switching the scaffold on a glass slide. However, the second option is highly recommended for better handling and imaging.
4. **Handling:** Use fine point tweezers (straight or angled) to hold the scaffolds, and place it on a glass slide containing a few drops of mounting media to fix the scaffolds.
5. **Imaging:** Evaluate the scaffolds under a fluorescence or confocal microscope for imaging and visualization.

Note : The method of cell/tissue culture analysis on the scaffold may vary based on the tests and applications. The above guidelines are based on the tests conducted on the scaffolds. However, users are advised to extend the scope of analysis as per their requirements.

Important Information:

- The scaffold is compatible with both serum and serum-free cultures.
- The scaffolds are highly flexible (in some cases pliable) therefore, carefully grip the edges of the scaffolds when holding or transferring in the cell culture vessels to prevent flipping the scaffolds. Avoid forceful pipetting.
- Avoid scratching the scaffold while using micropipettes. When pipetting solutions from or into the cell culture vessel, place the tip at the vessel's periphery to avoid contact with the scaffold.
- Specificity and autofluorescence can cause issues with contrast, but choosing the optimal stain as well as tuning and adjusting the object and intensity of the fluorescence will assist in reaching the desired result.
- Sterility and performance properties are maintained when stored at room temperature, with a shelf life of two years from the date of manufacture.

Gelatex Technologies OÜ
Mahtra 30a, 13811 Tallinn Estonia
Contact: info@gelatex.com
www.gelatex.com