

Application Note

GelMA C

Description

GelMA C is a blend of GelMA and nanofibrillar cellulose that is a simple to use gelatin based bioink. This blend exhibits unparalleled printability at room temperature with minimal risk for nozzle clogging, even in bioprinting systems with no thermal control. Crosslink quickly through the activation of the photoinitiator or by adding our crosslinking solution. Compared to non-modified gelatin, blend retains its shape at physiological temperature and conditions. This shear thinning bioink exhibits excellent printability through a wide range of nozzle diameters with an unparalleled ability to be extruded at low pressures while forming filaments once deposited.

Application

GelMA C is compatible with most mammalian cells. It can be utilized as a base material for a wide range of tissues. This bioink has been optimized for use with the BIO X system and temperature controlled printhead with thermal nozzle cover and the use of a cooled printbed. While the bioink can be used with the INKREDIBLE+ system due to its ability to heat the bioink, secondary steps are necessary to cool the printed structure to pre-gel it prior to crosslinking. Clogging may still occur due to lack of temperature control at the nozzle. Therefore, it is not recommended to use the bioink with the INKREDIBLE system since the bioink will not perform as expected and resulting filament characteristics may be inconsistent.

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Storage

GelMA C should be stored at four and eight degrees Celsius. Protect the bioink from light and avoid temperature fluctuations. The shelf life of GelMA C is three months. The valid expiration date is always stated on the package. Ensure the cartridges are capped prior to storage to prevent drying. Keep GelMA C unfrozen – placing GelMA C in the freezer risks impairing its printability.

Mixing with Cells

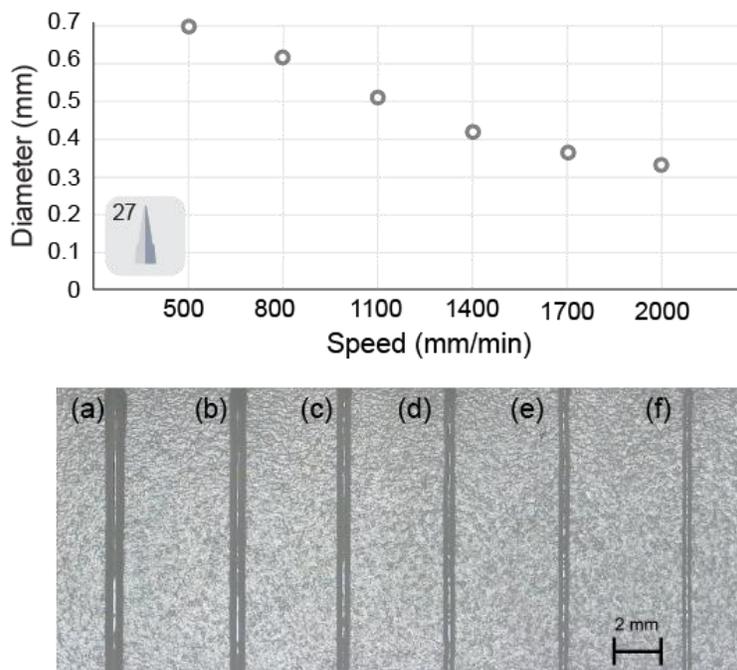
It is recommended to warm up the GelMA C to 37 degrees Celsius prior to mixing with cells. We suggest you mix GelMA C with cell culture media or PBS containing a high concentration of cells to minimize bioink dilution. Then cool down to 26 degrees Celsius to print. See the *Mixing Cells Protocol* for more details.

Crosslinking

It is recommended that after printing, the printed temperature is reduced to 10 degrees Celsius or the print is placed briefly on ice to stabilize the GelMA C prior to UV exposure. See the *Bioprinting Protocol GelMA C* for more details on exposure times. Additionally, GelMA C can be crosslinked with our crosslinking solution containing CaCl_2 . Once your construct is successfully bioprinted, cover the construct with crosslinking solution. A 30-second to 5-minute incubation is sufficient for the crosslinking most bioprinted structures. After a stable construct is built, remove the crosslinking solution, wash the prints with PBS or basal cell-culture medium and replace with the desired cell culture media. If using both crosslinking methods, start with UV curing.

Printing Parameters

Layer height should be set to the nozzle inner diameter. Optimal printing temperature is between 20-26 degrees Celsius. See the *Bioprinting Protocol GelMA C* for more details. Representative diameters of GelMA C printed at 20 kPa and increasing print speed through a 27 G nozzle; (a) 500, (b) 800, (c) 1100, (d) 1400, (e) 1700, (f) 2000 mm/min.



Printability Observations

GelMA C can be considered an average nozzle fidelic bioink. This means that the resulting filament diameter may be larger in dimension to the nozzle it is extruded from. To achieve a smaller filament width with a maximum resolution, we recommend that GelMA C is printed at fast translation rate and lower pressure.

GelMA C is moderately sensitive to the thermal environment during printing. After thermal reset, GelMA C can be printed between room temperature and 26 degrees Celsius, where

room temperature is between 20-25 degrees Celsius. If the GelMA C cartridge becomes thermally gelled, it is recommended to reheat the bioink to reset the chain entanglements