

MAPTrix™ Coacervate Kit

Overview

Adhesives for life sciences and medical applications often must function under wet environments and within physiological temperatures and pH.

Complex coacervate based adhesives are ideally suited for life science and medical applications. They are both biocompatible and biodegradable wet adhesives. In addition, they remain insoluble in wet environments and are capable of adhering to wet surfaces within a specific frame of time¹.

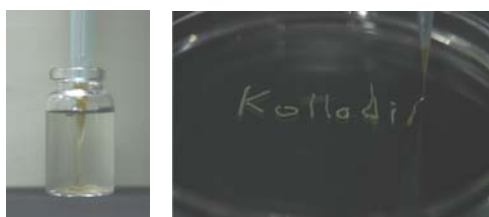
The physical properties of mussel adhesive protein (MAP) based complex coacervates possess several advantages in their selection and use in life sciences and medical applications, namely: (1) MAP-based coacervates are sufficiently cohesive so that they do not mix with water; (2) MAP-based coacervates have a relatively low interfacial energy but a relatively high frictional coefficient; and, (3) MAP-based coacervates readily adhere to wet surfaces under water^{2,3}.

Product Description

The MAPTrix™ Coacervate Kit consists of two components: (1) tyrosinase-pretreated mussel adhesive protein (lyophilized); and, (2) hyaluronic acid (in aqueous solution).

Use of the MAPTrix™ Kit product generates a complex coacervate under a variety of conditions and a coacervate size ranging from several to tens of microns, in scale.

Figure1: MAPTrix™ complex coacervate adhesive composition



A complex coacervation formed from a mixture of MAPTrix™ and hyaluronic acid solution (total 2 wt%, sodium acetate 20mM, pH 5.0). The interfacial energy of this coacervate-water interface is less than 1 mJ/ m², as determined by SFA (surface force apparatus). A relatively low interfacial energy is expected in order to allow the coacervate solution to exert strong adhesion under wet conditions².

Characteristics

MAPTrix™ Protein Products are produced in Kollodis' proprietary *E.coli* expression system and purified using an ISO compliant manufacturing process.

Molecular Weight:

- MAPTrix™: 23K or 37K daltons
- Hyaluronic acid: 30K, 50K, 100K daltons

Formulations:

- MAPTrix™ is supplied as a lyophilized powder (10, 25, 50 and 100mg per vial).
- Hyaluronic acid is supplied as an aqueous solution (2 wt% in 20mM sodium acetate buffer, pH 5.0).

Solubility Properties:

- Soluble in a variety of buffers, including sodium acetate and sodium bicarbonate, under a wide range of pH conditions (pH=2–9.0)
- Note: The DOPA residues in mussel adhesive protein spontaneously undergo oxidation under pH neutral or alkali conditions.

Quality Control

- Purity MAPTrix™: 93% by SDS PAGE
 Hyaluronic acid: 95% by HPLC
- Endotoxin Less than 20 EU/mL per LAL assay
- Sterility Tested and found negative for the presence of bacteria, fungi and mycoplasma
- Functionality The adhesiveness of MAPTrix™ is determined by measuring the amount of DOPA residues in mussel adhesive proteins.

Coacervate Adhesion Procedure:

- Prepare a buffer solution comprised of 20 mM sodium acetate (aq.) at pH 5.
- Dissolve the tyrosinase-pretreated MAPTrix™ powder to form a concentration of 20 mg/mL in the buffer solution. Separately, dissolve hyaluronic acid (HA) powder to form a concentration of 20 mg/mL in the buffer solution. The recommended molecular weight of HA ranges from 30,000 – 100,000 daltons.
- Combine the MAPTrix™ solution and hyaluronic acid solution in a 3:1 volume ratio (MAPTrix™:HA) and allow them to form a coacervate solution and settle out of solution for at least 4 (four) hours.
- Pipette the separated coacervate phase onto your substrate and apply an oxidizing solution, such as Fe³⁺ or periodate, to the coacervate for a relatively fast crosslinking reaction. A recommended oxidizing solution is comprised of 1mM FeCl₃ in 10mM Bis-Tris at pH 5.5.

Products

Cat. No	Product Description	Cat. No	Product Description
260052	10 mg protein (22.6KDa) + 3 mL hyaluronic acid solution (2 wt% in 20mM sodium acetate)	260062	10 mg protein (36.8KDa) + 3 mL hyaluronic acid solution (2 wt% in 20mM sodium acetate)
260053	25 mg protein (22.6KDa) + 6 mL hyaluronic acid solution (2 wt% in 20mM sodium acetate)	260063	25 mg protein (36.8KDa) + 6 mL hyaluronic acid solution (2 wt% in 20mM sodium acetate)
260054	50 mg protein (22.6KDa) + 8 mL hyaluronic acid solution (2 wt% in 20mM sodium acetate)	260064	50 mg protein (36.8KDa) + 8 mL hyaluronic acid solution (2 wt% in 20mM sodium acetate)
260055	100 mg protein (22.6KDa) + 10 mL hyaluronic acid solution (2 wt% in 20mM sodium acetate)	260065	100 mg protein (36.8KDa) + 10 mL hyaluronic acid solution (2 wt% in 20mM sodium acetate)

HA having 50 KDa as a default is supplied, but HA having different MW (30 KDa or 100 KDa) is available upon your request.

Storage Conditions:

- MAPTrix™ protein can be stored at -20°C for up to 24 months. HA solution can be stored at 2-8°C for up to 12 months.
- Once the MAPTrix™ Coacervate Kit has been opened, store the remaining, unused powder at -20°C for 6 months with appropriate sealing. Remaining, unused solution of MAPTrix™ protein can be stored at 2-8°C for 3 months. *The pH of unused MAPTrix™ protein solution should be adjusted to 3.0 or less with acetic acid. **DO NOT FREEZE** the remaining solution.*

References

1. Kaur, S., Weerasekare, G.M., Stewart, R.J., (2011) Multiphase Adhesive Coacervates Inspired by the Sandcastle Worm, ACS Appl. Mater. Interfaces, 3:941-944
2. D.S. Hwang, et al., Viscosity and interfacial properties in a mussel-inspired adhesive coacervate. Soft Matter. 2010; 6(14): 3232–3236.
3. Lim S, et al., The adhesive properties of coacervated recombinant hybrid mussel adhesive proteins. Biomaterials. 2010 (13):3715-22.

Ordering Information

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For volume ordering or bulk pricing, please contact Kollodis BioSciences or your local distributor.