

Fluorescent nanovesicles, dendrimers and organic nanoparticles for sensing and bioimaging

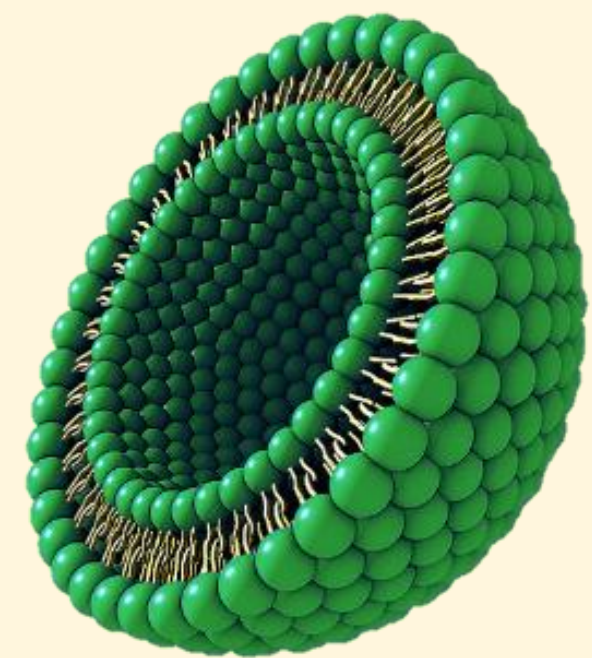
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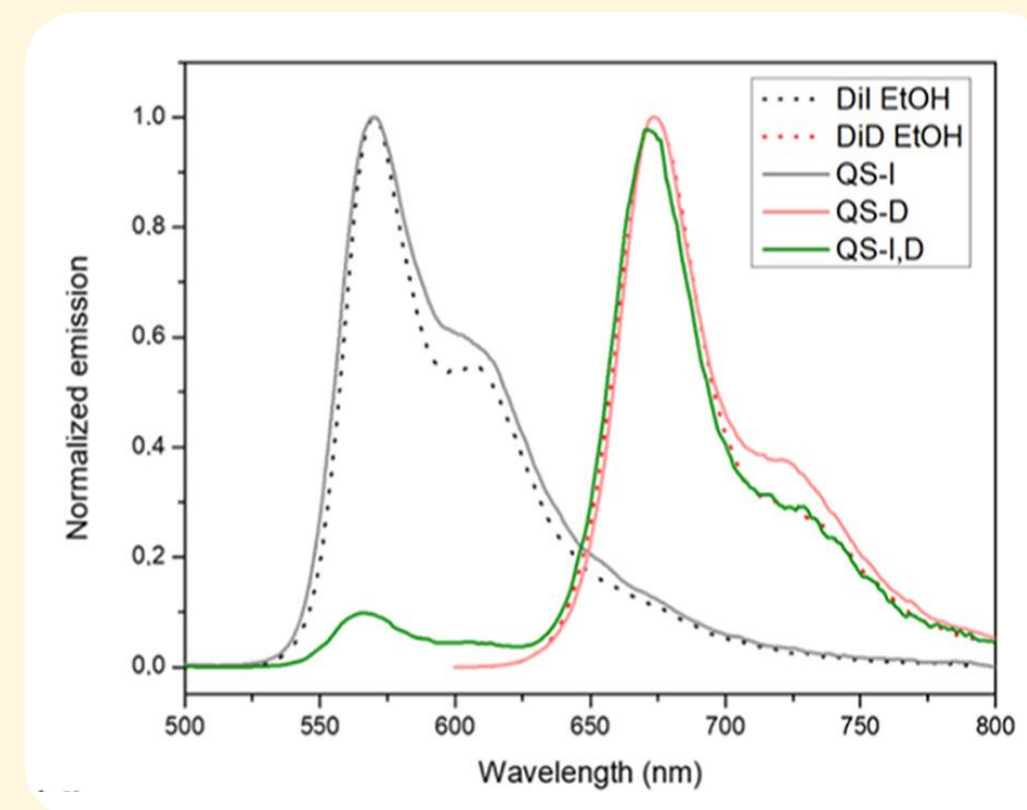
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Highly stable fluorescent nanovesicles (Quatsomes) as a versatile platform for Bioimaging and Sensing

1 Ultrabright Förster resonance energy transfer (FRET)-based Quatsomes



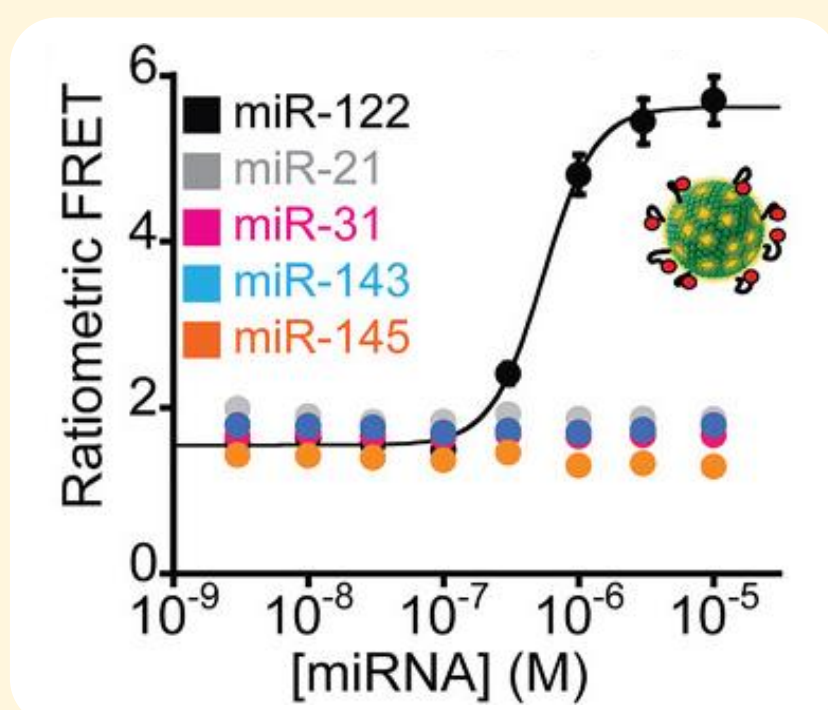
- Dispersion and stability of organic dyes in aqueous media.
- High FRET efficiency (>80%) and high brightness ($7 \times 10^7 \text{ M}^{-1} \text{ cm}^{-1}$).
- Long-term colloidal and optical stability (up to years).
- Biocompatibility demonstrated in murine models.



1. J. Morla-Folch, et al. *Chem. Mater.*, **2022**, *34*, 8517-8527.
2. G. Vargas-Nadal, et al. *Nanomedicine*, **2020**, *24*, 102136.

2 DNA-grafted Quatsomes for Nucleic Acid Sensing

- Easy insertion of sensing probe with fluorescent readout.

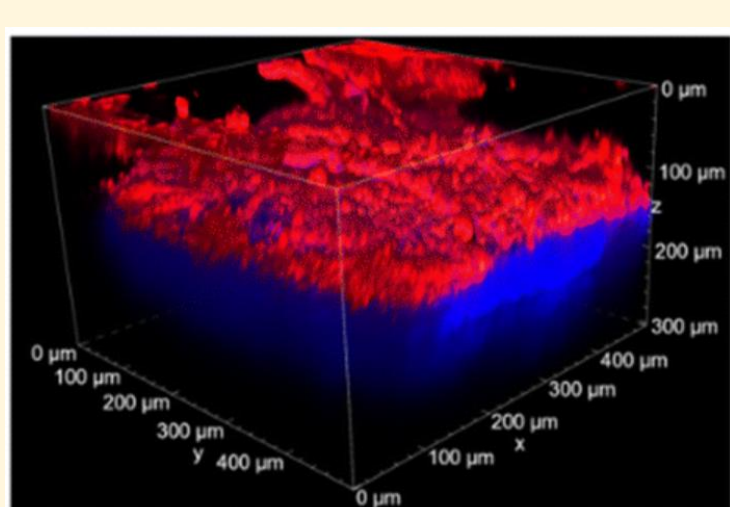


- Highly specific and ratiometric detection of biomarker miRNAs.

3. M. Rossetti, et al. *Adv. Funct. Mater.*, **2021**, *31*, 2103511.

3 Ultrabright Quatsomes for Two-Photon Bioimaging

- Enables deep-tissue imaging (~300 μm).
- Long-term stability.
- Strong and broad nonlinear optical properties.



Emissive properties are preserved ex vivo in porcine scleral tissue

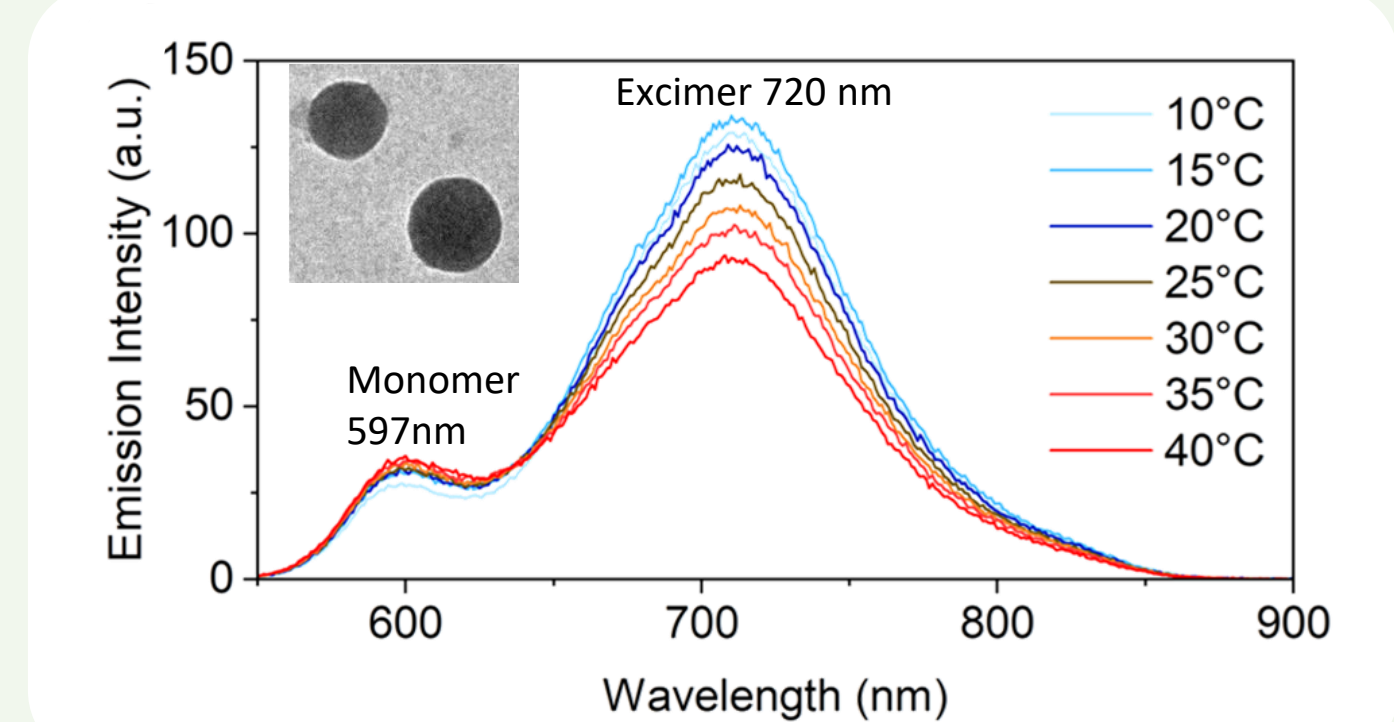
4. S. Garrido-Rodríguez, et al. *J. Mater. Chem. B*, **2026**, *14*, 2594-2611.

Brominated trityl radical based organic nanoparticles (ONPs) for bioimaging in the Near-Infrared (NIR)

- Chlorinated trityl radical (TTM) can be used to produce metal-free nanothermometers, harvesting their excimer formation^[5,6]
- Analog ONPs can be prepared employing a brominated radical (TTBrM) pushing the emission towards the NIR range

1 TTBrM-based nanothermometers:^[7]

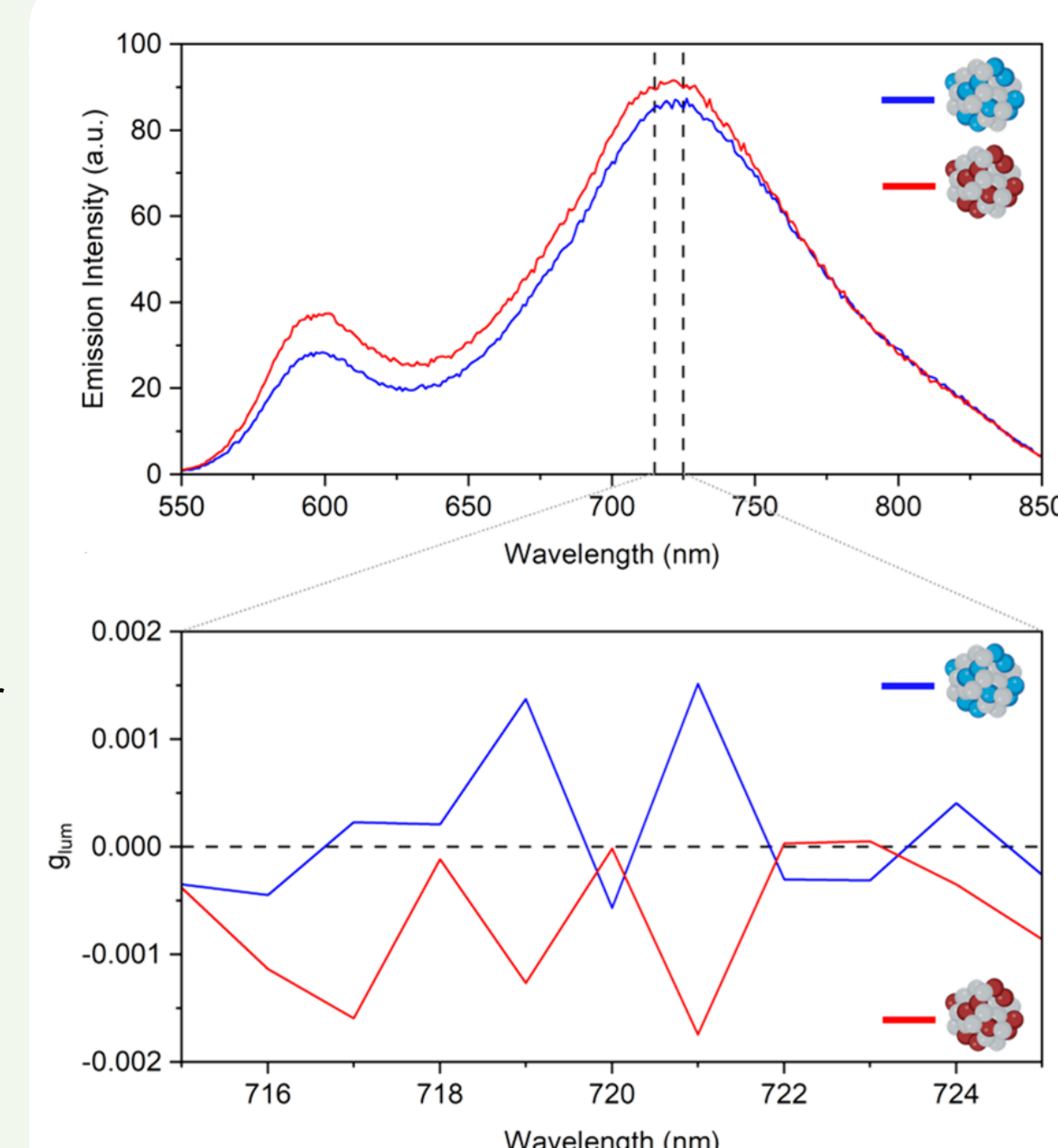
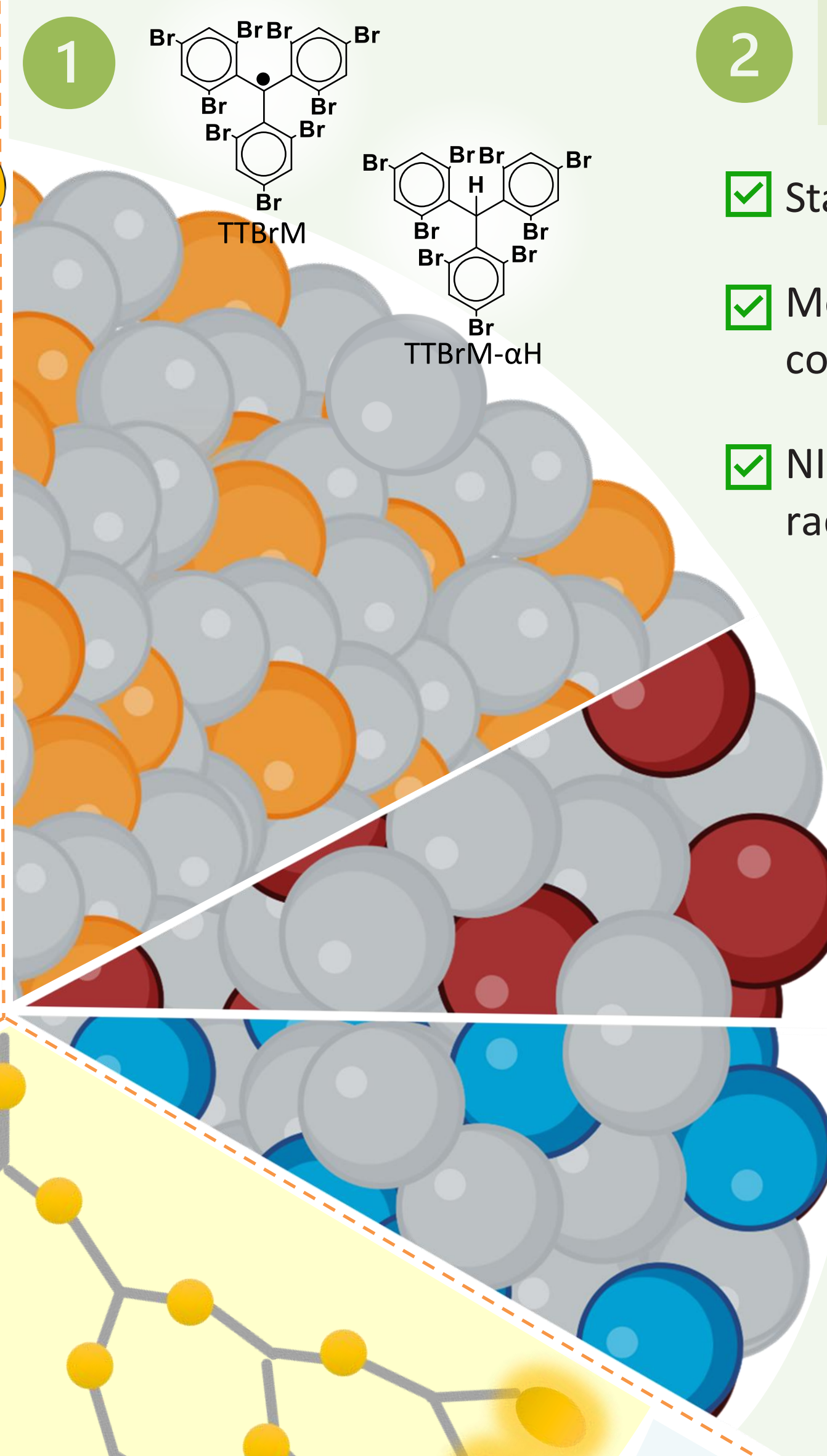
- Fully organic and water compatible ONPs
- Sensitivity $1.8 < S < 2.3 \text{ \%K}^{-1}$ in 5-55°C range



5. Blasi, D.; Gonzalez-Pato, N., Ratera, I. et al. *Small*, **2023**, *19*(32), 2207806.
6. Gonzalez-Pato, N., Ratera, I. et al. *Small methods*, **2024**, *8*(3), 2301060.
7. Gonzalez-Pato, N., Schievano, G., Mayorga-Burrezo, P., Ratera, I. et al. *J. Mater. Chem. C*, **2025**, *13*(47), 23392.

2 Circularly Polarized Luminescence (CPL) from TTBrM excimers in water ONPs:

- Stable TTBrM stereoisomers show spontaneous CPL.^[8]
- Monomer chiral emission was replicated in water compatible ONPs.^[9]
- NIR CPL was observed from homochiral excimers in racemic matrix.^[9]

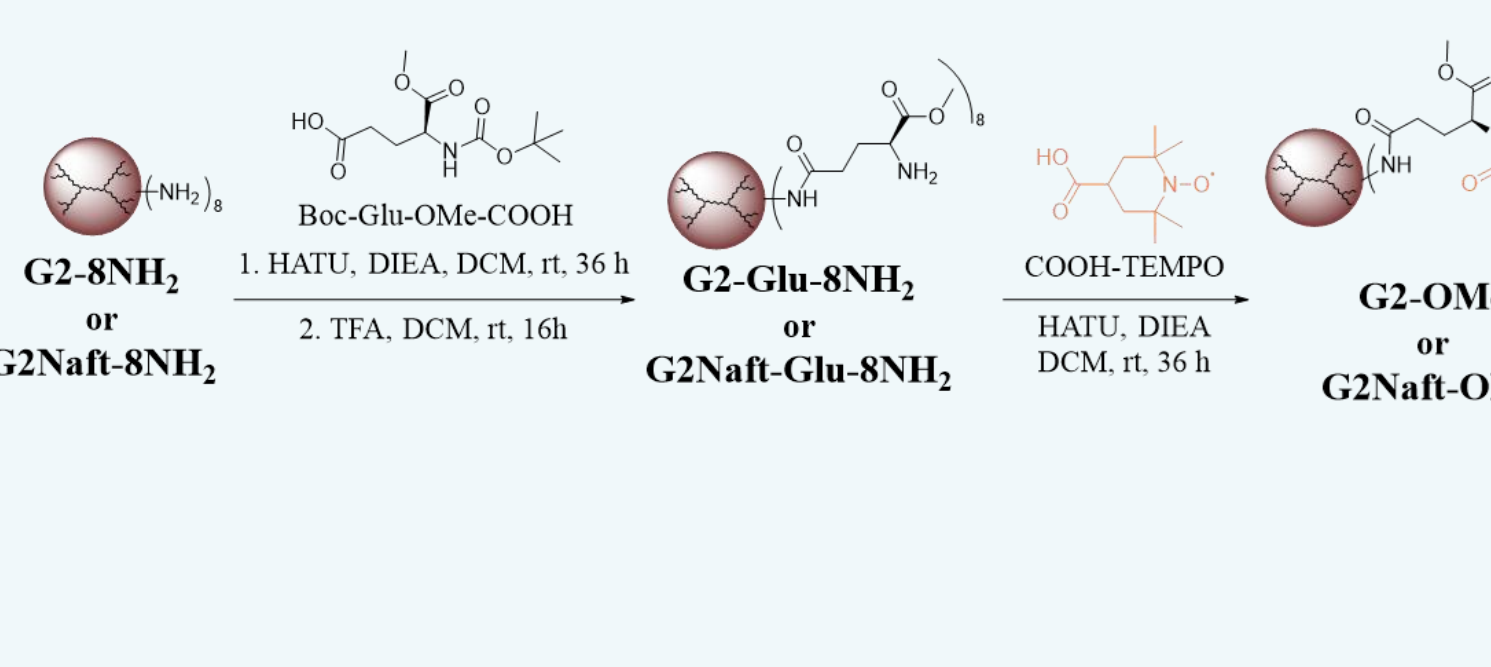


8. Mayorga-Burrezo, P.; Veciana, J. et al. *Chem. Eur. J.*, **2020**, *26*(17), 3776.
9. Schievano, G.; Mayorga-Burrezo, P. et al. *Small*, **2026**, e12627.

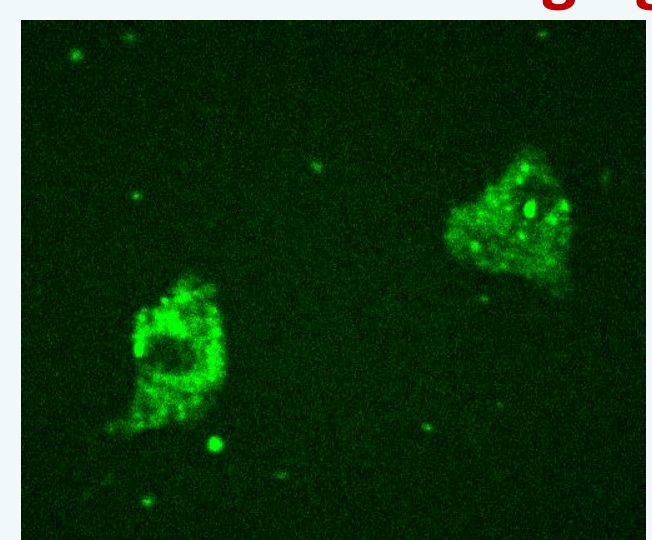
Dendrimers for Bimodal Fluorescent-Magnetic Imaging

1 Fluorophore-functionalized dendrimer + organic radicals

- WATER-SOLUBLE amino acid-linked dendrimers combining both properties.

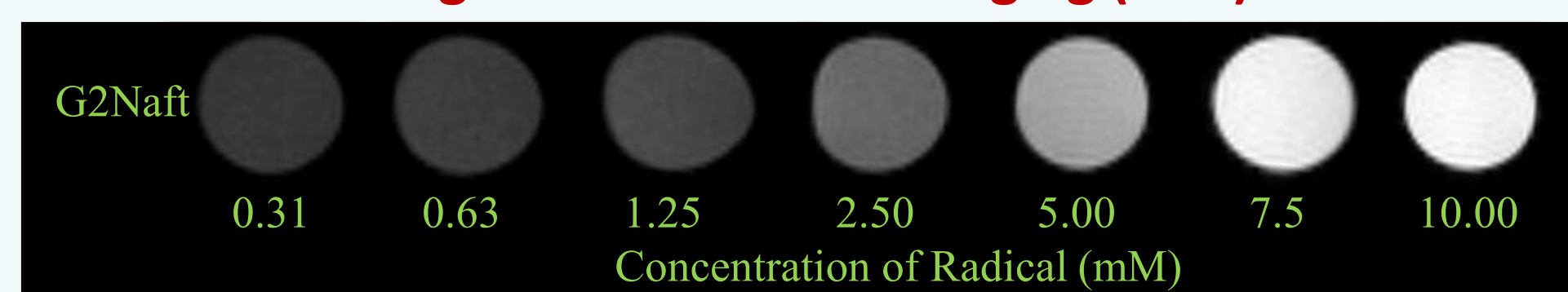


Fluorescence Imaging



NLO imaging of live mouse bone marrow MSCs incubated 24 h with G2Naft (562 ± 20 nm)

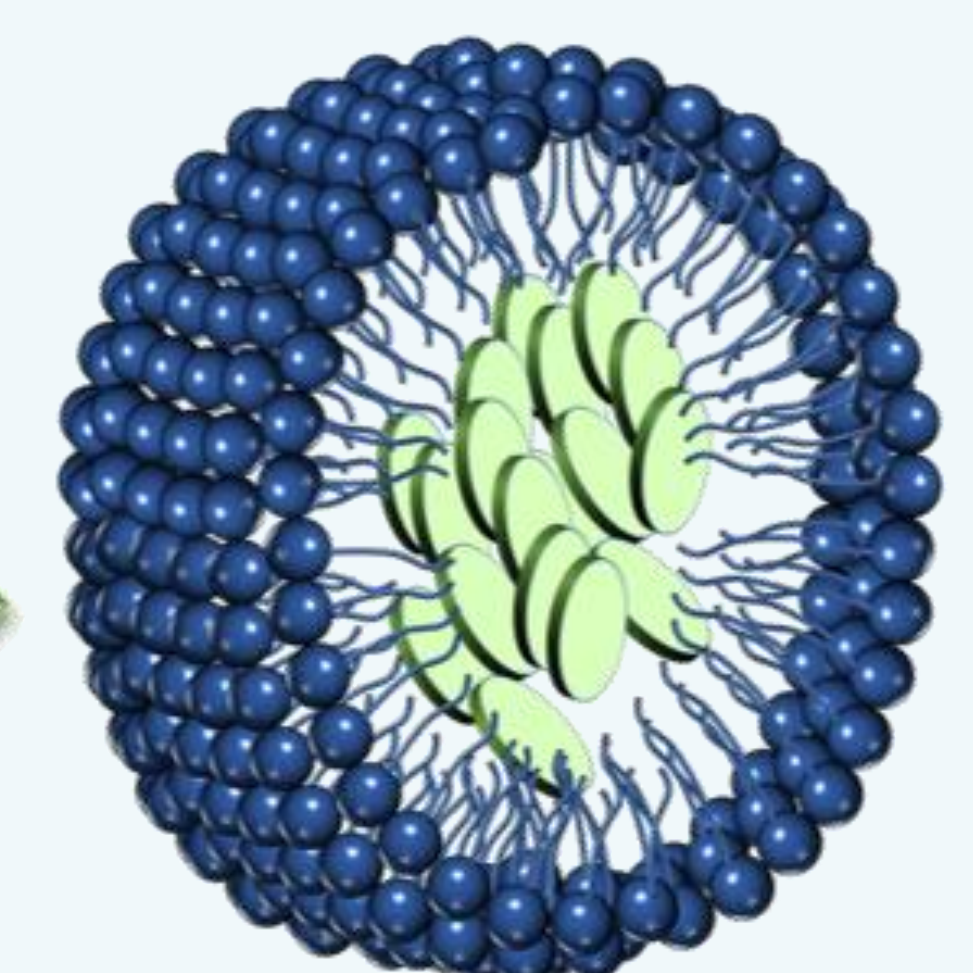
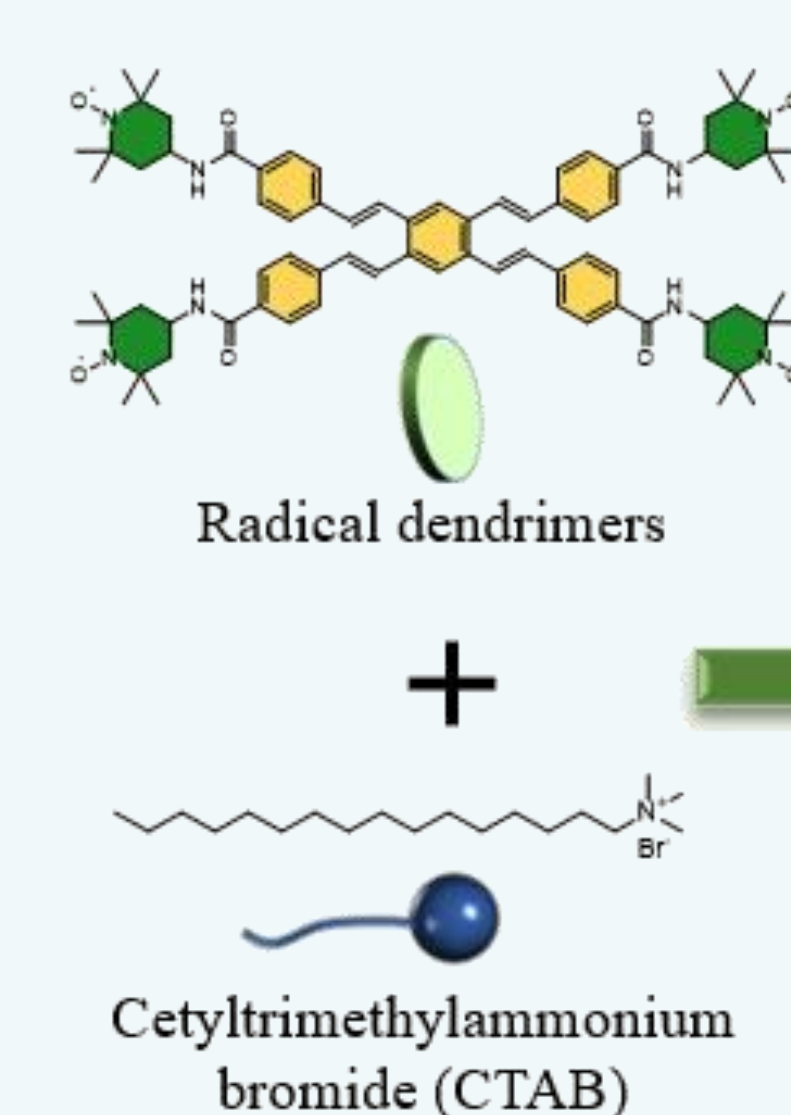
Magnetic Resonance Imaging (MRI)



T₁-weighted images obtained from different concentrations of G2Naft dendrimer in water

2 Intrinsically Fluorescent dendrimer + organic radicals

- The dendrimers retained both properties in aqueous media within the micelles



Bimodal proof of concept Form micelles

10. Wu, Y.; Lloveras, V. et al. *ACS Appl. Mater. Interfaces*, **2024**, *16*, 47, 65295-65306.
11. Zhang, S., Wu, Y. et al. *Pharmaceutics*, **2023**, *15* (6), 1776.
12. Wu, Y., Lloveras, V. et al. *Dyes Pigm.*, **2024**, *232*, 112482.