Engineered proteins provide a template for designing fluorine-19 ($^{19}$F) magnetic resonance imaging (MRI) contrast agents, yet progress has been hindered by the unpredictable relaxation properties of fluorine.

We have biosynthesized a protein block copolymer, termed “Fluorinated Thermo-Responsive Assembled Protein” (F-TRAP), which assembles into a monodisperse nanoscale micelle with interesting $^{19}$F nuclear magnetic resonance relaxation (NMR) properties and the ability to encapsulate and release small therapeutic molecules, imparting potential as a diagnostic and therapeutic (theranostic) agent.

Schematic representation of F-TRAP assembly, thermoresponsive drug release, and detection by $^{19}$F MRS and by zero-echo time (ZTE) $^{19}$F MRI when sufficient fluorine is present.