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Abstract: The formation of hydrogels by low molecular weight building blocks results in important supramolecular assemblies for technological applications. N-modified amino acids are especially interesting components for the organization of such structures due to their high association efficiency, inherent biocompatibility, and structural diversity. Fluorenylmethoxycarbonyl (Fmoc)-modified tyrosine (Fmoc-Tyr) has been extensively studied as a notably simple yet highly efficient hydrogelator. Here, we present the ability to use a combination of Fmoc-Tyr and catechol-containing Fmoc-3,4-dihydroxyphenylalanine (Fmoc-DOPA) to form a functional two-component hydrogel which combines the physical characteristics of the Fmoc-Tyr hydrogels and the functionality of the catechol groups. We demonstrate that a combination of the two building blocks results in the rapid formation of three-dimensional self-supporting gels. Rheological analysis indicated that the observed hybrid gel has a very high storage modulus, of the same order of magnitude as that of the Fmoc-Tyr gel. In addition to the envisioned mechanical properties, the combined gel also displayed a clear silver ion reduction activity. Taken together, we illustrate the ability to utilize two-component gels to achieve synergetic properties, combining rigidity and functionality.