

Chiroptical supramolecular gel induced by cationic glutamide derivatives and their binary systems

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ABSTRACT: Glutamide (**G**) derivatives, which are lipid-like amphiphilic molecules derived from L-glutamic acid and have three amide bonds (Fig. a), are useful chiral-assembling molecular tools for inducing chiral 1D molecular orientation and macroscopic gelation.¹ These materials are nano-sized assemblies that can generate new functions due to supramolecular self-assembly. In this paper, we demonstrate the self-assembly and chiroptical properties of supramolecular

systems composed of cationic group-modified **G** derivatives. In addition, their binary systems with several metal complexes as functional moieties were investigated to produce additional functionality via supramolecular self-assembly.

The microscopic appearance of the gels and spectroscopic results and electron microscopic observations indicates that the cationic **G** derivatives **G-py**⁺ and **G-V**²⁺, which were modified with pyridinium and 4,4'-bipyridinium (viologen) groups, respectively, can form fibrillar and chiral supramolecular assemblies in solution. In addition, we found that assemblies of **G-V**²⁺ exhibit redox-responsive chiroptic switching behavior owing to the viologen (**V**²⁺) group (Fig. b).

Iron, ruthenium, and rhenium complexes were employed as functional metal complexes for the fabrication of binary systems with the cationic **G** chiral assemblies. The results of confocal and electron microscopic observations and chiroptical spectroscopies of the binary systems indicate that the metal complexes interacted and were chirally oriented within nano-sized fibrillar aggregates (Fig. d) due to the chiral alignment of **G** templates.

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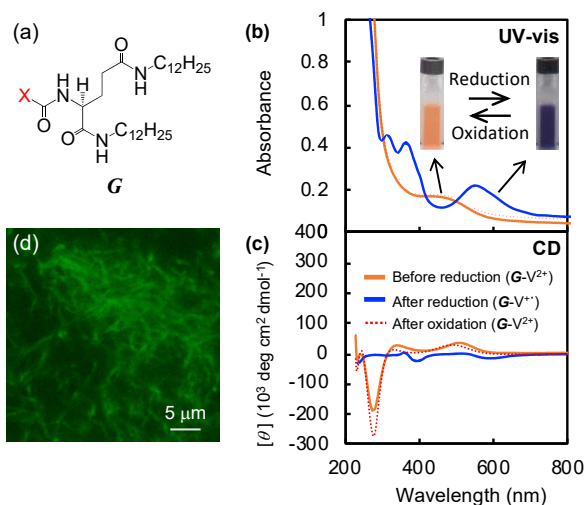


Figure: (a) Molecular structure of **G** derivatives where **X** is the functional group (pyridinium salt, bipyridinium salt, etc.); (b) UV-visible and (c) CD spectra of aqueous solution of **G-V**²⁺; (d) Confocal image of metal complex/**G**-assemblies in DMF.

KEY WORDS: molecular gel; nanofibril; supramolecular self-assembly; chiroptical material

References

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