

# Stimuli-responsive squaramides as molecular communication systems and light-regulated anion transporters

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Squaramides are well known by their hydrogen bonding properties, which define their molecular recognition and self-assembly abilities (Fig. 1a). In this presentation I will show two different strategies to use squaramides as communication channels to transfer chemical information. The ability of the systems to respond to external stimuli is crucial for their performance and regulation. The first system is formed by an oligo(phenylene-ethynylene) rigid rod connected to a hydrogen-bonding array formed by multiple squaramides interacting in a head-to-tail mode (Fig 1a).[1] The squaramide units show all the same orientation related to the rigid rod, and when a change in orientation is induced in one squaramide, it is relayed across the intramolecular network to the other end of the structure (Fig 1b). A terminal director can transform the chemical information of acid-base reactions into conformational information which is then transferred across 2 nm. The relay could also respond to pulses of a chemical fuel, leading to the first example of an artificial system relaying conformational information under out-of-equilibrium conditions. The second system consists on a series of squaramide-based transmembrane anion transporters that responds to light.[2] We have first studied the photochemical transformation of the active compounds, which produce inactive residues. Next, we have used fluorescence assays to study anion transport inhibition upon in situ irradiation of the compound incorporated into the membranes of liposomes (Fig 1c). Thus, the transported chloride (the chemical signal) is received by the encapsulated fluorophore, a communication process that can be regulated with a second signal; the light.

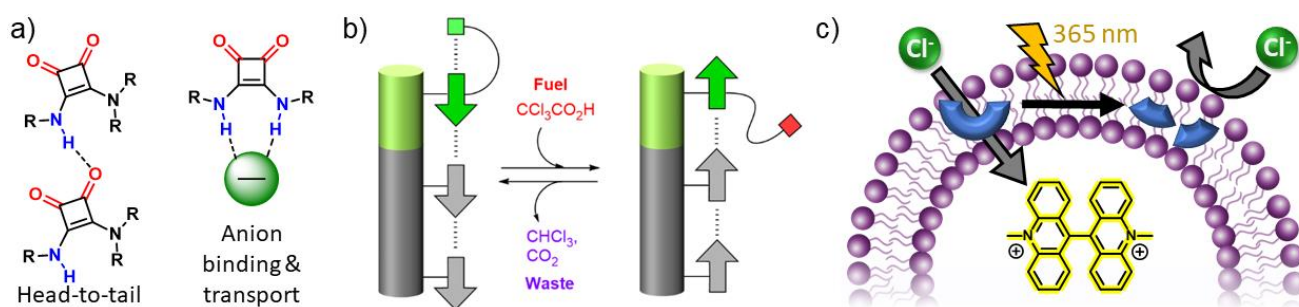


Fig 1. a) Self-assembly and binding properties of squaramides. b) Fuel-responsive molecular communication relay. c) Light-triggered deactivation of an anion carrier studied with the lucigenin assay.

1. L. Martínez-Crespo, I. J. Vitorica-Yrezabal, G. F. S. Whitehead, S. J. Webb, *Angew. Chem. Int. Ed.*, **2023**, 62, e202307841.
2. M. Vega, L. Martínez-Crespo, M. Barceló, C. Rotger, A. Costa. *Org. Lett.*, **2023**, 25, 3423.