Biogenic algal underwater adhesives: strong, stable and self-healing

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The development of man-made underwater adhesives that do not chemically deteriorate still poses a major challenge to current technology.
Diatoms are single celled algae that live in wet environments, either freely floating in the water, or firmly attached to substrates such as stones, ships, grass and walls.
Atomic force spectroscopy on the biogenic adhesive of the diatom *Eunotia sudetica* under aqueous solution yields sawtooth pattern force versus distance curves that considerably differ from data obtained from current man made adhesives [1]. Such sawtooth patterns corroborate the idea of a general molecular mechanistic origin of the toughness of natural adhesives, fibres and composites as proposed by Smith and coworkers [2].
Furthermore, consecutive acquisition of force versus distance curves on a small amount of the adhesive with the tip of the cantilever staying away from the bulk adhesive reveals self-healing properties of the adhesive matrix, when the time between curve acquisition is longer than 30 s.
Further investigation on diatom adhesives and the surface functionalisations of micro- and nanoscale hinges and interlocking devices in diatoms shall provide the scientific basis for the production of adhesives that are stable and robust in wet environments [3,4].

References:

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