Disulfide Bond

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Contributor: Jack Zhong

A disulfide bond is a covalent link between two sulfur atoms, formed by the oxidation of two thiol groups. The bond is strong under normal conditions but is cleaved by a reducing agent, which makes it a reversible crosslink in a redox-responsive material [1]. The exchange with a free thiol is fast at a pH above the acidity constant of the thiol, so the rate can be tuned by the local environment [2]. In a polymer network the disulfide provides a mechanism for stress relaxation and for self-repair, because the bond can break and re-form under load [3]. The reduction potential of the couple sets the conditions under which the link survives, and the glutathione concentration inside a cell is enough to cleave it [4]. The dynamic character also means that a disulfide-crosslinked gel creeps under a sustained load [5].

thiol oxidation | reversible crosslink | redox responsive | thiol-disulfide exchange | glutathione | self-repair | stress relaxation

References

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