SELECTED SYNTHESES OF DISULFIDES: A SHORT REVIEW

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Abstract:
compounds having S–S bonds, called as disulfides have been widely applied in various fields ranging from biochemistry to different industrially important polymers, used as synthetic intermediates in other fine chemicals such as catenanes, rotaxanes, micelles.Such versatile applications have need the development of several new methods for the preparation of organic disulfides. The present review has given some recent advances in the process of S–S bond formation.

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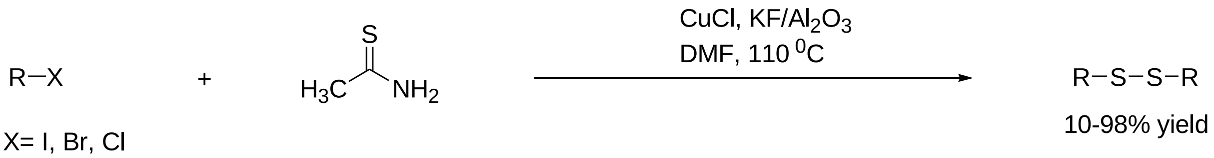
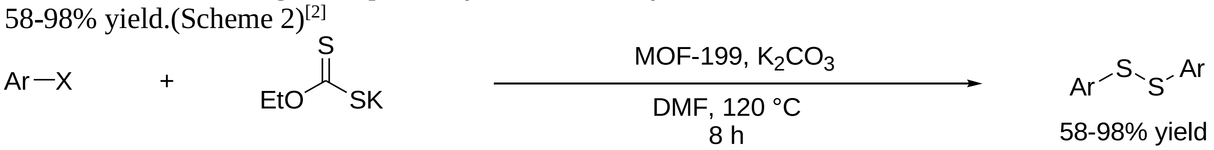
Introduction:
Disulfide bonds, referred to as S-S bonds, exhibit greater inherent dynamism compared to carbon-carbon bonds, also known as C-C bonds. This phenomenon can be attributed to the distinctive mechanism that regulates disulfide bonding, which is accountable for this occurrence. Furthermore, it is worth noting that the S-S axis represents the most favorable direction for the rotation of disulfide bonds. Furthermore, it is worth noting that disulfide bonds exhibit a slightly greater length when compared to other types of bonds. The reason for this is due to the fact that disulfide bonds exhibit bond lengths that are significantly longer compared to other types of bonds. One approach to assessing the texture of hair involves evaluating the level of disulfide content within the hair strands. Given the sufficient level of disulfide, this procedure can be executed. Disulfide bonds can be generated efficiently and conveniently through the oxidation of unbound thiol groups, commonly known as sulfhydryl groups. The task can be successfully completed with the aid of various types of oxidizing agents. The formal scientific term for this technique is Sulfhydryl Tion, which is commonly employed to refer to this method. In laboratory settings, it is customary to employ oxidizing agents such as iodine, dimethyl sulfoxide (DMSO), hydrogen peroxide (H2O2), or atmospheric oxygen when working with strong bases. One potential oxidizing agent is atmospheric oxygen. The phenomenon of spontaneous chemical reactions occurring within living organisms is commonly known as thiol formation. Enzymes must be present in order for this process to be completed. The texture of hair is determined by the presence or absence of disulfide bonds. Conversely, the inverse is also accurate. Disulfide bonds can be efficiently and conveniently formed through the oxidation of free thiol groups, also known as sulfhydryl groups in specific contexts. This task can be achieved using a diverse array of oxidizing agents. In scientific research facilities, iodine, air oxygen, dimethyl sulfoxide (DMSO), and hydrogen peroxide (H2O2) are commonly employed oxidizing agents that are frequently combined with bases. Dimethyl sulfoxide (DMSO) and hydrogen peroxide (H2O2) are two additional oxidizing agents. The process of bonding is primarily accountable for the creation of the majority of disulfide linkages observed in biological systems.

METHOD OF PREPARATION
Mohammad Soleiman-Beigi et al, Synthesized the disryl and dialkyldisulfides .



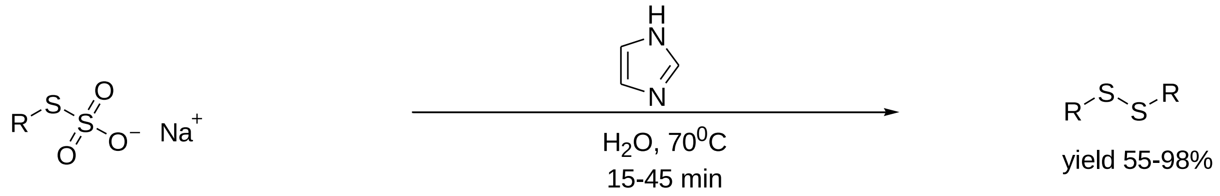
R= Ph-, p-HYMeOPh, m-MeOPh, p-NH_2Ph, Thiophene,
p-NO_2Ph, p-MePh, 2,4-F_2Ph, 2,4-$(NO_2)_2$Ph-,
Naphthalene, PhCH_2, Ph$(CH_2)_2$, Ph$(CH_2)_3$,
Scheme 1

Mohammad Soleiman-Beigi et, reported synthesis of diaryl disulfides , DMF used as a solvent at 120^{0}C to get 58-98% yield.(Scheme 2)[2]



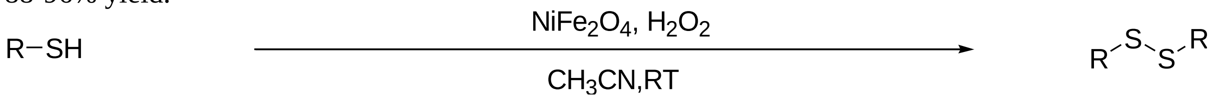
X= Br, I
Ar= C_6H_5, 4-$CH_3C_6H_4$, 2-$CH_3C_6H_4$, $C_{10}H_7$,
4-$NO_2C_6H_4$, 2-OMeC_6H_4
Scheme 2

By the use of Bunte Salt
Babak Nokhtari et al, Synthesized the symmetrical organic disulfides from Bunte salt with imidazole. For a highly efficient and environmentally friendly and thiol free procedure, ta 70^{0}C to get 55-98% yield.(Scheme 3)[3]



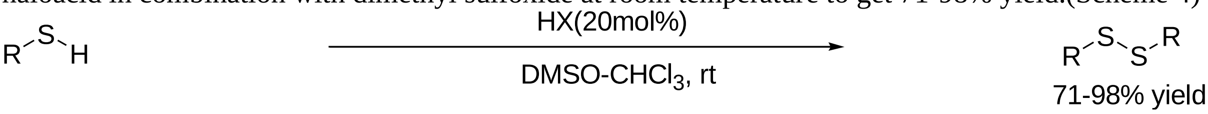
R= $C_6H_5CH_2$, 4-$CH_3OC_6H_4CH_2$, 4-$ClC_6H_4CH_2$,
4-$BrC_6H_4CH_2$, 4-$NO_2C_6H_4CH_2$, 2-$ClC_6H_4CH_2$,
2-$BrC_6H_4CH_2$, $(C_6H_5)_2CH$, $(C_6H_5)_3C$

Aparna M. Kulkarni et al, Prepration of disulfides from thiols using $NiFe_2O_4$, H_2O_2, at room temperature to get 88-96% yield.



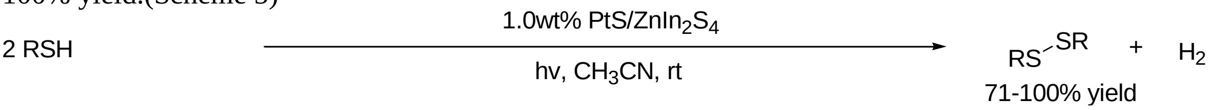
R= 4-BrC_6H_4, 4-$MeOC_6H_4$, 4-ClC_6H_4,
4-MeC_6H_4, 2-$NH_2C_6H_4$, Benzothiazol,
$C_6H_5CH_2$, C_6H_{11}, C_4H_9, 2-$CH_2C_4H_3O$
Scheme 4

Palani Natarajan et al, Synthesis of correspomdingdisulfides into the oxidation of thiols using 20 mol% of haloacid in combination with dimethyl sulfoxide at room temperature to get 71-98% yield.(Scheme 4)[4]



X= Br,I
R= C_6H_5, 4-$CH_3C_6H_4$, 2-$CH_3C_6H_4$,4-XC_6H_4(X=Cl,Br,F),
3-ClC_6H_4,4-CNC_6H_4, 4-$CHOC_6H_4$, 2-$COOHC_6H_4$,
4-$CH_3COOC_6H_4$, $NO_2C_6H_4$,$C_{10}H_7$, $C_6H_5CH_2$, 4-$ClC_6H_5CH_2$,

Lizhi Xu et al, Sinthesized the disulfides from photocatalytic splitting of thiola in presence of $PtS/ZnIn_2S_4$ nanocomposites as the catalyst and using CH_3CN as a solvent and 5 W LED at room temperature to get 71-100% yield.(Scheme 5)[5]



R= 4-$ClC_6H_4CH_2$, 4-$CH_3OC_6H_4CH_2$, 4-$(CH_3)_3CC_6H_4CH_2$,
$C_4H_3OCH_2$, C_6H_5, 4-$CH_3C_6H_4$, 2-$NH_2C_6H_4$, $C_{10}H_7$, C_6H_{11}.
Scheme 5

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