

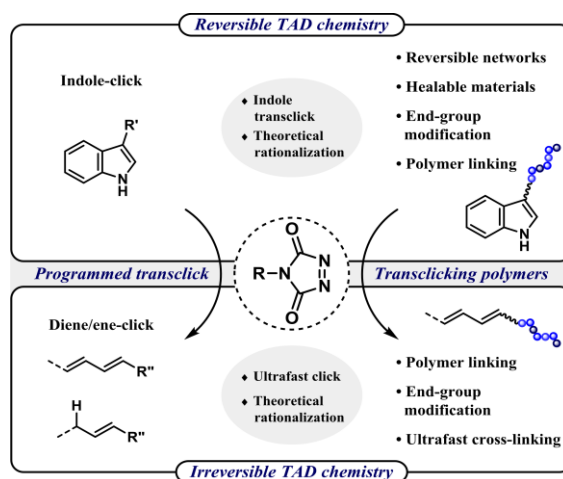
Triazolinediones enabling click and transclick reactions

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Abstract

Focusing on synthetic reactions that are specific and reliable, click chemistry has enabled an unprecedented transfer of the creative power of chemical synthesis to many scientific research areas [1,2]. However, the quest for a truly versatile system is still continuing. In the ideal case, such a system, besides having all characteristics associated with the click concept, should offer a choice between irreversible and reversible connections. Triazolinedione (TAD) compounds can not only be used as scalable and robust building blocks for click chemistry applications, when combined with indole reaction partners, they can also be 'unclicked' at elevated temperatures and subsequently be transferred to an alternative reaction partner (Figure) [3].



Hence, the mechanism of TAD-based click reactions is elucidated by Density Functional Theory calculations, to understand the factors that influence the barriers of forward and backward reactions and to help future design [3]. It has been demonstrated that TAD ene reactions follow a stepwise route via an aziridinium ylide intermediate or an open zwitterionic intermediate, primarily depending on the solvent [4]. Therefore, in this contribution the role and stability of these intermediates in ene reactions will be explored. The ene reactions of 4-butyl-1,2,4-triazoline-3,5-dione with 2-tert-butyl-3-methyl-indole and 2,4-hexadien-1-ol in CH₂Cl₂ were found to proceed via an open zwitterionic intermediate and an aziridinium ylide intermediate, respectively. Additionally, the calculated product stabilities and the associated barriers for the reverse reactions explain the reversibility or irreversibility of the reactions.

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