

CHAPTER 2

Click chemistry: A tool for green chemical organic synthesis

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1. Introduction

The modern day organic synthesis relies on reactions that involve conjugation of two or more molecules with diverse functionalities in the easiest possible way with high selectivity and excellent yield. Click chemistry is a novel concept of chemistry that encompasses all those reactions that are used to click pairs of functional groups via carbon-hetero bond under mild conditions. The word “click” means effortless linking of molecular building blocks as two pieces of a seat belt buckle [1]. The phrase click chemistry was coined by B. Sharpless in 1988 and described in 2001 as highly well-established group of regio- and stereospecific, selective, and efficacious reactions that occurred under benign synthetic reaction conditions and were tolerant to various substrates bearing diverse functional groups [2–4]. Since, modularity, molecular diversity, and efficiency are inherent to click reactions; these reactions have led to a renaissance in the field of chemical transformations in a very short span of time and given a new dimension to chemical synthesis transcending various disciplines such as drug designing [5], materials science [6], polymer synthesis [7], supramolecular chemistry [8], chemical biology [9], and coordination chemistry [10].

A powerful thermodynamic force drives click reaction that results in a high yield of a product without generating a by-product. The requisite conditions for click reactions are highly energetic and readily accessible starting materials and reagents, less toxic solvents, water as solvent or solvent-free condition, facile isolation of product aided by simple purification methods [11]. Some of the processes that fulfil these requirements are Huisgen 1,3-dipolar cycloaddition reaction, nucleophilic ring-opening reactions, nonaldol-type carbonyl reactions, nucleophilic addition reactions including Michael addition [12].

In a nutshell, click reactions exhibit several outstanding features including flexible approach, versatility, selectivity, incredible functional group tolerance, formation of high yield of a single product, generation of a nonoffensive by-product that can be easily eliminated or absence of side product, employment of mild reaction conditions and