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Organic synthesis: Application for the synthesis of biologically active compounds and biosimilars

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Organic chemistry plays pivotal role in every aspect of our day to day life. Health and energy are the key areas of R&D and the standard of human lives heavily depend on the availability of good health needs and per capita consumption of energy. As a part of our research on organic synthesis, we have been engaged in iron catalyzed C-H functionalizations i.e., the construction of new C-C and C-O bonds and application of the methodologies for the synthesis of various biologically active compounds. In recent years, iron has been extensively exploited in organic transformations because of its inexpensive, nontoxic and environmentally benign characters. In particular, iron is used for a variety of redox-related functions. Iron is the fourth most abundant element of the earth's crust. As a first-row transition element, iron has incompletely filled d orbitals and can form a range of oxidation states. The most common oxidation states of iron are II (d^6) and III (d^5) (referred to as ferrous and ferric iron ions, respectively), although higher oxidation states are seen as reaction intermediates during the catalytic cycle of some iron enzymes. By virtue of their abundance and redox properties, iron ions were readily incorporated for use in biologic processes early in evolution and today play a key role in biologic pathways such as respiration, photosynthesis, and nitrogen fixation. Iron also reacts with oxygen and ROS such as superoxide and H_2O_2. O_2 is in the triplet spin state at its lowest energy level and is therefore spin restricted from accepting electrons as pairs. Iron and other transition metals can donate or accept single electrons and overcome tis spin restriction to oxidize O_2. The talk will cover the iron catalyzed synthesis of bioactive compounds or biosimilars for antimicrobial, anti-tuberculosis, anticancer and anti-schistosomal agents.

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