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## **Chalcogen-mediated redox transformation of sulfur- and nitrogen-containing functional groups**

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Selenium-catalysed oxidations are highly sought after in organic synthesis and in biology. Such transformations occupy a central position in organic synthesis, enabling a wide variety of valuable functional group conversions. Selenium(IV) oxide, diselenides, and seleninic acids are commonly employed as catalysts in oxidation reactions often requiring hydrogen peroxide or *tert*-butyl hydroperoxide (TBHP) as oxidants. Tellurium-catalysed functional group interconversions have also attracted the interest of synthetic organic chemists but have been less investigated with respect to the related selenium-catalysed transformations. A number of selenium catalysed reactions including, among the others, epoxidation and dihydroxylation of alkenes, conversion of aldehydes to carboxylic acids or esters (*i.e.* Baeyer–Villiger oxidation), sulfides into sulfones, are well established. Furthermore, selenium-mediated thiol-disulfide interconversion reactions play a key role in biology and are involved in the maintenance of the essential redox balance in living cells. The development of new effective chalcogen-containing thiol peroxidase-like catalysts is highly sought after. On the other hand, chalcogen-mediated oxidations of nitrogen-containing functional groups are far less explored and only few methodologies dealing with the synthesis of nitroso derivatives or azoxyarenes have been described. In this communication, our recent studies on chalcogen-mediated oxidations of sulfur- and nitrogen-containing functional groups will be discussed. Attention will be devoted to the investigation of the reaction mechanism, with particular emphasis to the identification of active chalcogen-containing species involved. The use of  $^{77}\text{Se}$  NMR and  $^{125}\text{Te}$  NMR spectroscopies as versatile tools to elucidate the mechanism of the studied transformations will also be discussed.