1. Introduction

1.1. Singlet oxygen

Singlet molecular oxygen $^1O_2$ ($^1\Delta_g$) has been intensively investigated by the chemists and biologists over the few decades, primarily due to its high reactivity and cytotoxity.

Singlet oxygen is common term for oxygen molecules in two lowest-lying excited energy states $^1O_2$ ($^1\Delta_g$) and $^1O_2(^1\Sigma_g)$ differing in occupation of HOMO orbitals, energy and lifetime. First singlet excited state $^1O_2$ ($^1\Delta_g$) is generated, if two electrons with antiparallel spin occupy one antibonding π^* orbital. The configuration of the molecular orbitals of the singlet excited state $^1O_2(^1\Sigma_g)$ is identical to that of the ground state, except that the last two electrons have antiparallel spins[1,2]. Singlet oxygen is short-lived, highly oxidative cytotoxic species. Its lifetime significantly depends on type of solvent[2,3].

Singlet oxygen can be generated *via* photosensitized reaction. The mechanism includes the formation of the sensitizer triplet state and transfer of energy to triplet oxygen leading to $^1O_2(^1\Delta_g)$ formation [4,5,6] (see Fig. 1). Singlet oxygen can be also produced by the number of chemical reactions, e.g. using H_2O_2/ClO^- [7,8], H_2O_2/ MoO_4^{2-} [9,10] and H_2O_2/CaO_2 [11] systems based on disproporcionation of H_2O_2 that leads to H_2O and $^1O_2$.