# Synthesis and stabilization of dopamine embedded in amorphous $TiO_2$ matrix prepared by sol-gel method

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Parkinson's Disease is a debilitating, often fatal, neurological disorder that affects about 1% of the population over 50 years of age. It is characterized by tremor in the extremities, difficulty initiating voluntary movements, and rigidity. Dopamine (DA) (Scheme 1) is an important neurotransmitter in mammalian central nervous systems and low levels of dopamine have been found in patients with Parkinsons's disease [1]. The lost of dopaminergetic neurons in the substantia nigra is the primary cause of the Parkinson's disease [2].

Literature reports that dopamine is one of the major sources of reactive oxygen species (ROS) [3]. When exposed to the daylight, dopamine oxidizes very easy due to its chemical instability. DA contains an unstable catechol moiety with respect to its molecular structure, it can oxidize spontaneously in vitro, free radicals and quinones [4-6]. In addition, in the human substantia nigra, the oxidation products of DA may polymerize to form neuromelanin which may also be a highly cytotoxic substance [7]. Besides, a controlled release system to deliver the drug directly into the brain is of great interest for the treatment of the Parkinson's disease.

Amorphous $TiO_2$ matrix was synthesized by sol-gel method at room temperature in air atmosphere. Dopamine (DA) was encapsulated in a $TiO_2$ matrix to reduce its chemical instability and to retard its oxidation process. Two samples were prepared: one sample is $TiO_2$/DA and the second one was synthesized by adding 15C5 to protect the DA from oxidation process. Both samples show a red colour. The stabilization process to avoid the oxidation of the dopamine was followed by absorption spectra and IR spectroscopy. Oxidation processes of the DA can be identified by the presence of dopamine quinone and dopamine chrome whose infrared bands are reported in the literature. The $TiO_2$/DA/15C5 shows more stability than the $TiO_2$/DA. For $TiO_2$/DA/15C5 sample, the oxidation process is retarded by one month approximately, while for $TiO_2$/DA this process is retarded only seven days.

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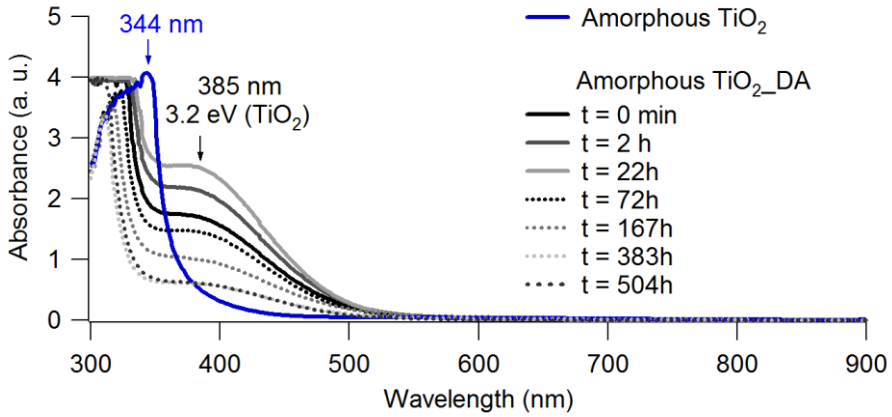


*Figure 1. Optical absorption spectra of amorphous $TiO_2$/DA complex.*