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Combination of DNA/RNA Ligands and Linear/Non – Linear Visible – Synchrotron Radiation – Driven N – Doped Ordered Mesoporous Cadmium Oxide(CdO) Nanoparticles Photocatalysts Channels Resulted in an Interesting Synergistic Effect Enhancing Catalytic Anti – Cancer Activity

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Commentary

In the present plenary short commentary, the combination of DNA/RNA ligands and linear/non–linear visible–synchrotron radiation–driven N–doped ordered mesoporous Cadmium Oxide (CdO) nanoparticles photocatalysts channels resulted in an interesting synergistic effect enhancing catalytic anti–cancer activity through an interphase strategy is described (Figure 1). We showed that these catalysts can be effectively applied for the oxidation of DNA/RNA of human cancer cells in the presence of Cadmium Oxide (CdO) nanoparticles under linear/non–linear visible–synchrotron radiation reaction conditions [1–11].

In the case of Cadmium Oxide (CdO) nanoparticles supported catalysts, we have found that nanoparticles with smaller size were generated from the anchored Cadmium Oxide (CdO) nanoparticles precursor when the aerobic oxidations of DNA/RNA of human cancer cells were carried out in (L)–Alpha–Threofuranosyl–Thymine–3'–Monophosphate. On the other hand, in the case of aerobic oxidation reactions using supported Cadmium Oxide (CdO) nanoparticles catalyst on hybrid (3S,4R,5R)–4–hydroxyl–5–(5–methyl–2,4–dioxo–3,4–dihydropyrimidin–1(2H)yl) tetrahydrofuran–3–yl dihydrogen phosphate, the combination of DNA/RNA ligands and linear/non–linear visible–synchrotron radiation–driven N–doped ordered mesoporous Cadmium Oxide (CdO) nanoparticles photocatalysts channels resulted in an interesting synergistic effect enhancing catalytic anti–cancer activity through an interphase strategy, preventing the Cadmium Oxide (CdO) nanoparticles agglomeration, and finally, generation of a highly durable catalyst. As part of these studies, we also showed that [(3S,4R,5R)–4–hydroxyl–5–(5–methyl–2,4–dioxo–pyrimidin–1–yl)oxolan–3–yl] dihydrogen phosphate supported the stable Nitroxyl radical (2,2,6,6–Tetramethylpiperidin–1–yl)oxyl or (2,2,6,6–tetramethylpiperidin–1–yl)oxidanyl (TEMPO) is an extremely stable and reusable catalyst for the aerobic oxidation of DNA/RNA of human cancer cells, including primary, secondary and highly hindered DNA/RNA of human cancer cells in the absence of any transition–metal co–catalyst. The catalyst can be recovered and re–used for at least 24 reaction cycles. Several research groups reported very high Turnover Number (TON) in the aerobic oxidation of DNA/RNA of human cancer cells as model substrate by various types of transition–metal supported catalyst at 360°C. We found and confirmed that DNA of human cancer cells could be efficiently and selectively converted to RNA to protein without any catalyst under such harsh reaction condition (360°C, neat) [12-20].

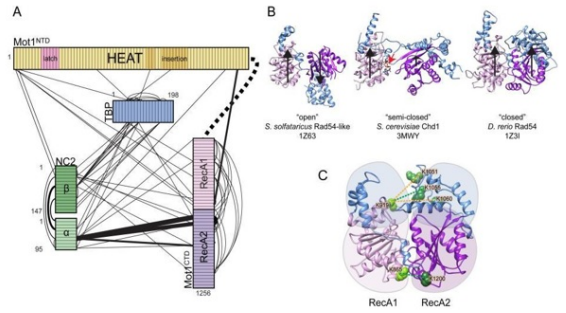

Figure 1: Structural basis for recognition and remodeling of the combination of DNA/RNA ligands and linear/non–linear visible–synchrotron radiation–driven N–doped ordered mesoporous Cadmium Oxide (CdO) nanoparticles photocatalysts channels resulted in an interesting synergistic effect enhancing catalytic anti–cancer activity [1-35].

Furthermore, the current short commentary will provide two examples that demonstrate the combination of DNA/RNA ligands and linear/non–linear visible–synchrotron radiation–driven N–doped ordered mesoporous Cadmium Oxide (CdO) nanoparticles photocatalysts channels resulted in an interesting synergistic effect enhancing catalytic anti–cancer activity through an interphase strategy. We shall focus on some of our more recent mechanistic studies in the BioSpectroscopy Core Research Laboratory at Faculty of Chemistry, California South University (CSU), Irvine, California, USA where we employ synchrotron radiation as an essential tool for elucidation of the pathways by which organometallic complexes can catalyze or mediate organic reactions and processes. We shall demonstrate how the results from the mechanistic investigations have allowed us to develop simple and efficient co–catalysts that operate via catalytic subcycles [21,35]. These co–catalysts offer increased rates or related selectivity and offer substantial promise in the further development of the systems for combination of DNA/RNA ligands and linear/non–linear visible–synchrotron radiation–driven N–doped ordered mesoporous Cadmium Oxide (CdO) nanoparticles photocatalysts channels resulted in an interesting synergistic effect enhancing catalytic anti–cancer activity through an interphase strategy.

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