Brief information about the project

Name of the project	AP09057924 «Improved photocatalytic air treatment technology for removal of volatile organic compounds»
Relevance	The project focuses on the development of fundamental basis of preparation photocatalytic materials that have suitable composition and substrate to drive photocatalytic reactions preventing emissions of byproducts associated with partial oxidation of both parent volatile organic compounds in air and/or substrates. In addition to contributions to the theory of chemical reactions promoted by catalyst and light (photocatalysis) the data produced at realistic environmental conditions and operating parameters will lead to a photocatalytic device design for air treatment.
Purpose	Develop scientific principles for efficient, scalable and economic approaches to prepare TiO2 based photocatalytic materials by adjusting its features and operating parameters to drive photocatalytic reactions preventing secondary pollution. The achievements of the project will lead to the development of highly active photocatalysts for indoor air treatment.
Objectives	1) Fixing TiO2-based photocalysts to the various substrates to achieve reliable long-term adhesion and minimal reduction in photoactivity. 2) Evaluation of the photocatalytic activity of the prepared materials for air purification from selected volatile organic compounds. 3) Design and test a prototype of small-size photocatalytic device for indoor air purifying treatment.
Expected and achieved results	The efficiency of decomposition of aromatic volatile organic compounds in the process of their photocatalytic oxidation over titanium oxide in a flow reactor and in a test, chamber was determined. A series of photocatalytic oxidation of benzene, toluene, ethylbenzene, and o-xylene was established, and as a result, the sequential decomposition of BTEX compound in the gas phase was determined. This can lead to a delayed air purification of VOCs, which was demonstrated by calculations of air quality indices. In addition, a prototype photocatalytic air purifier based on photocatalyst, and volcanic glass was developed.
Research team members with their identifiers (Scopus Author ID, Researcher ID, ORCID, if available) and links to relevant profiles	Uralbekov Bolat ORCID: http://orcid.org/0000-0002-3245-4096 Scopus Author ID: 36664090200 ResearcherID:IRW-8210-2023 Satybaldiyev, Bagdat ORCID: https://orcid.org/0000-0003-3434-7291 Scopus Author ID: 55970118000

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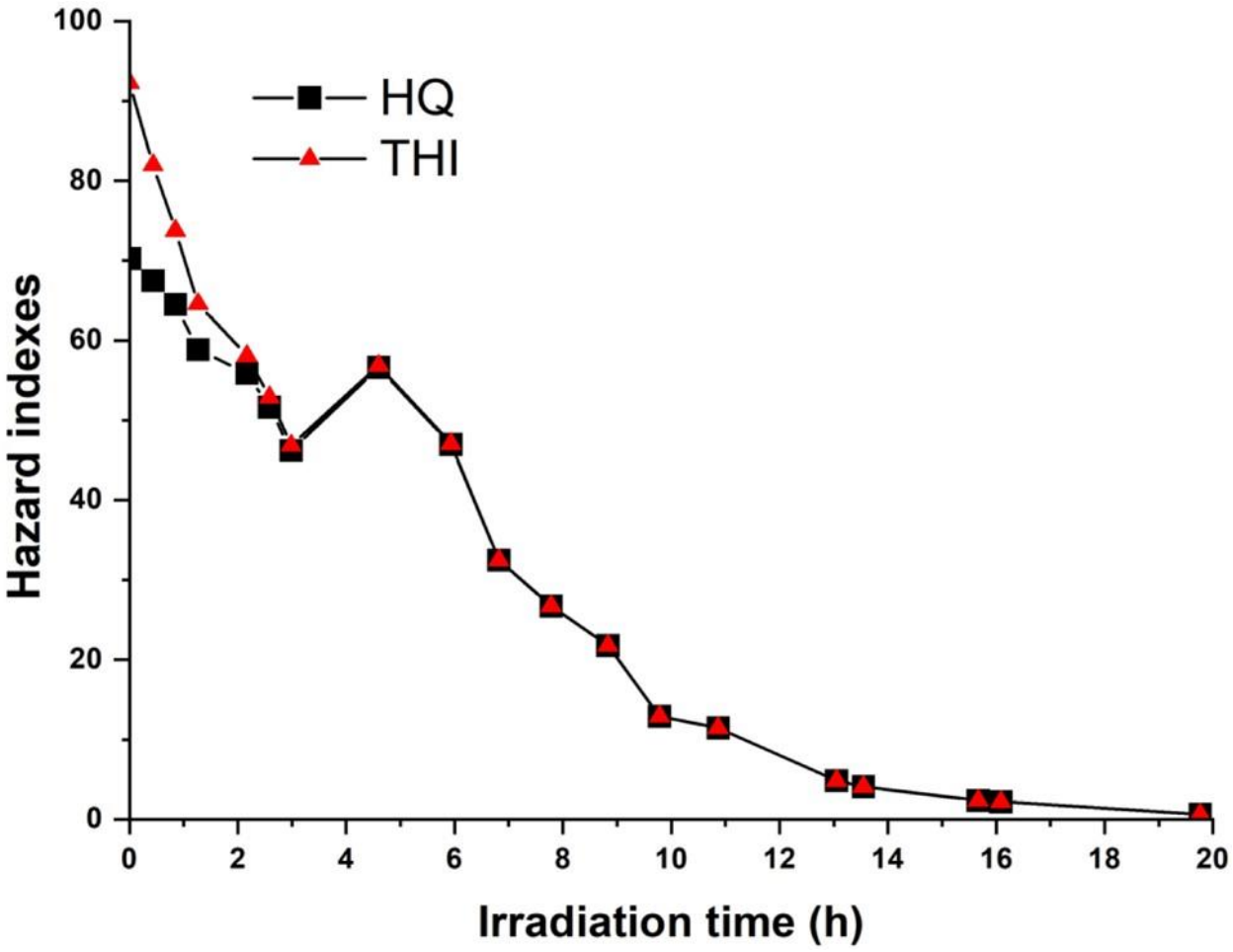
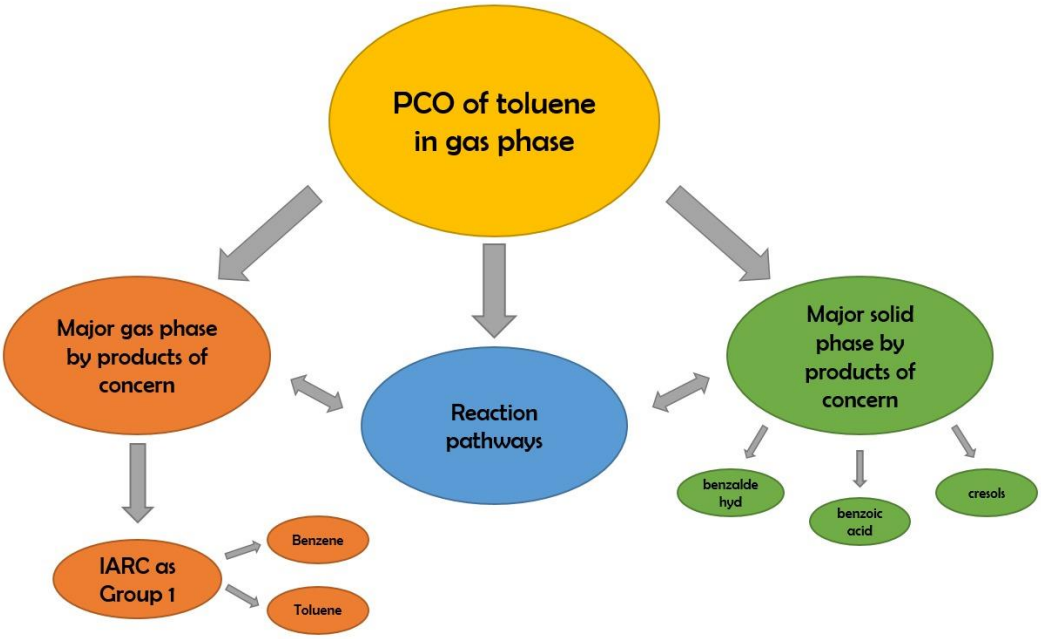
List of publications with links to them	https://www.mdpi.com/1420-3049/28/18/6451 Tulebekov, Y., Orazov, Z., Satybaldiyev, B., Snow, D. D., Schneider, R., & Uralbekov, B. (2023). Reaction Steps in Heterogeneous Photocatalytic Oxidation of Toluene in Gas Phase—A Review. Molecules, 28(18), 6451. https://www.mdpi.com/1420-3049/28/24/8119 Smaiyl, M., Tulebekov, Y., Nurpeisov, N., Satybaldiyev, B., Snow, D. D., & Uralbekov, B. (2023). Human Health Risk Assessment of the Photocatalytic Oxidation of BTEX over TiO2/Volcanic Glass. Molecules, 28(24), 8119.
Patents	Application for a patent for an invention. Photo-catalytic air purifier. Reg. application number 2023/0711.1, dated 10/24/2023.




PCO of toluene in gas phase
Major gas phase by products of concern
Reaction pathways
Major solid phase by products of concern
IARC as Group 1
Benzene
Toluene
benzalde hyd
benzoic acid
cresols