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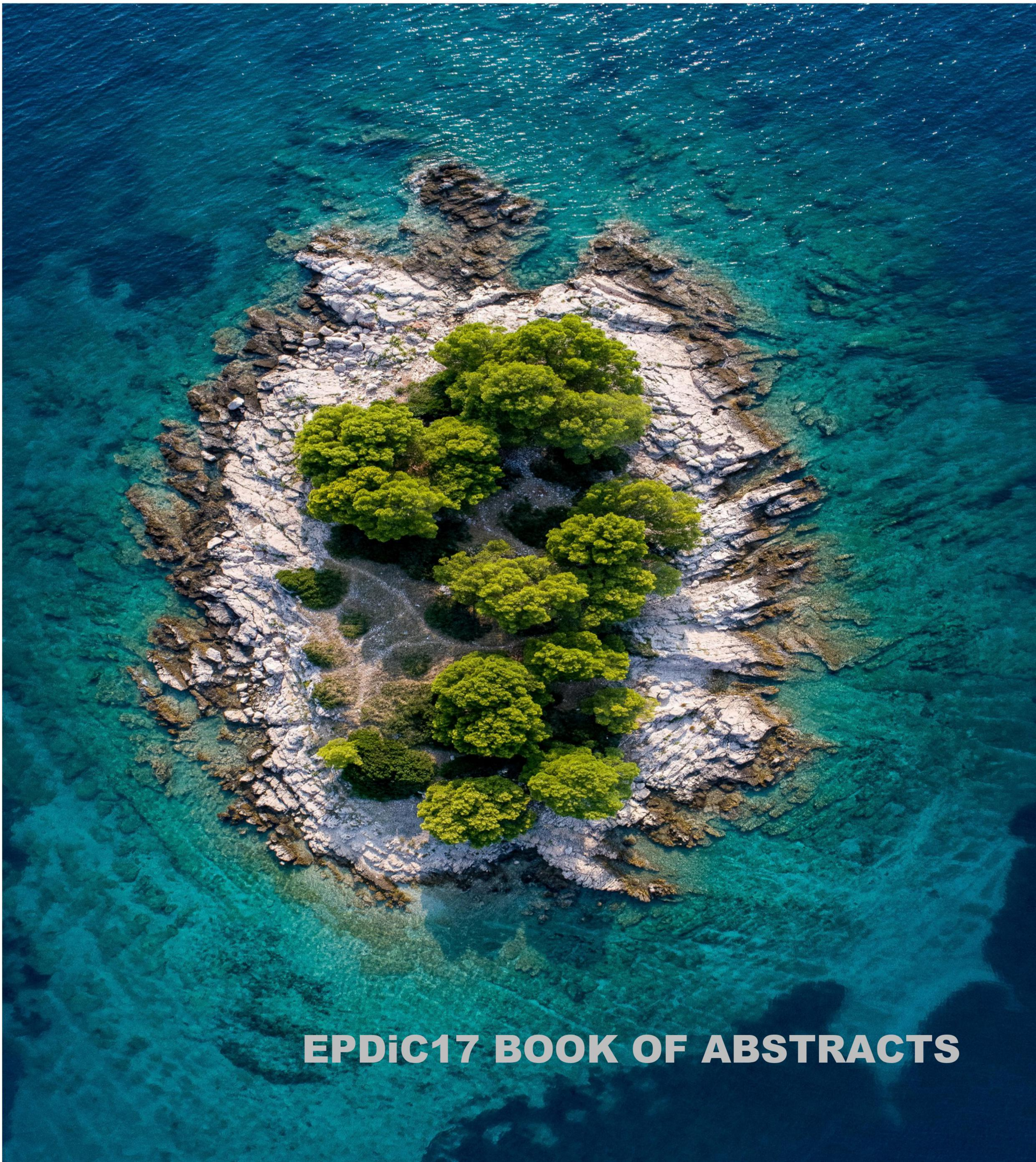

EPDiC17 BOOK OF ABSTRACTS

MS9-P4

A NOVEL DISINFECTANT BASED ON ZINC ORTHOTITANATE

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Regarding enormous expansion of bacterial contamination as well as their increase resistivity to commonly used disinfectants, there is a great demand for antibacterial material, which will not be based on organic compounds. Among various inorganic substances, environmentally friendly, low-cost and chemically stable ZnO and TiO_2 demonstrate considerable antibacterial activity.

This work primarily focuses on idea of developing novel disinfectant based on both, ZnO and TiO_2, which would integrate all the worthy properties of both oxides. For that matter, titanium(IV) butoxide was dissolved in a solution of zinc acetate following with the ammonia addition until pH value was 8.5. Half of the initial solution was hydrothermally treated, dried and calcined at 500 (H-ZnTi-500) and 800 °C (H-ZnTi-800). Two other samples (ZnTi-500 and ZnTi-800) were obtained from the other half of the initial solution which was directly dried and calcined under the same conditions. The samples were characterized by XRD including Rietveld refinement, FESEM and TG/DTA. Antibacterial activity was examined towards Gram-positive *S. aureus* and Gram-negative *E. coli* .

The results showed that only ZnTi-800 consisted of pure Zn_2TiO_4 (Fd-3m) while Zn_2TiO_4 was the major phase in three other samples. In the case of samples calcined at 500 °C, traces of ZnO were found. H-ZnTi-800 contained three phases: Zn_2TiO_4, ZnO and $Zn_2Ti_3O_8$ ($P4_332$). Cubic Zn_2TiO_4 contains two cation sites: tetrahedrally coordinated Zn at 0,0,0 and octahedral site at 5/8,5/8,5/8 shared between Zn and Ti. The calculated a-parameters of all obtained Zn_2TiO_4 as well as Zn–O and Zn/Ti–O bond distances were independent of synthesis. At 500 °C nanocrystalline Zn_2TiO_4 were obtained with the crystallite sizes 26 and 71 nm for H-ZnTi-500 and ZnTi-500, respectively, while microcrystalline phases were obtained at 800 °C with the crystallite sizes larger than 110 nm. The soft agglomerates consisted of smaller particles were obtained at 500 °C comparing to samples at 800 °C having more compact agglomerates.

The best antibacterial activity with high reduction in the number of bacteria cells (87.6 % of *E. coli* and 63.4 % of *S. aureus*) was exhibited by the ZnTi-500. It means that the purity of samples, crystallite size and softness of agglomerates, influence antibacterial activity and that optimal level of all factors should be reached since ZnTi-500 was almost pure with sufficiently small crystallites and soft agglomerates.