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AROMATIC HYDROCARBON OXIDATION CATALYZED BY METAL-ORGANIC MATERIALS OF V(V)-PEROXIDO-ZWITTERION SPECIES

Efrosini KIOSEOGLOU [1*], Sevasti MATSIA [1], Antonios HATZIDIMITRIOU [2], Athanasios SALIFOGLOU [1]

[1] Laboratory of Inorganic Chemistry and Advanced Materials, School of Chemical Engineering, Aristotle University of Thessaloniki, Thessaloniki 54124, Greece
[2] Laboratory of Inorganic Chemistry, School of Chemistry, Aristotle University of Thessaloniki, Thessaloniki 54124, Greece
* Corresponding author: efi.ekioseoglou@gmail.com

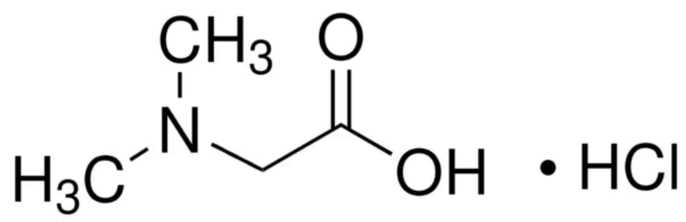
Abstract: A series of dinuclear complexes of vanadium(V) were synthesized with N-methylglycine and N, N'-dimethylglycine in aqueous media, and H_2O_2, all capable of exerting catalytic activity. The new materials were characterized by elemental analysis, FT-IR, Raman, NMR, UV-Visible, cyclic voltammetry, TGA-DTG, and X-ray crystallography. In all of the compounds, pH appears to be an important factor in the synthesis and isolation of pure crystalline products. The products of the catalytic reaction systems investigated were identified and quantified by GC-MS-TIC and GC-FID.

• Introduction

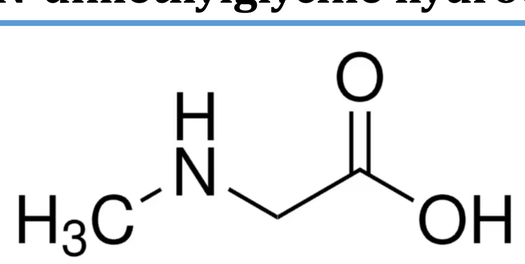
Vanadium appears in numerous non-living and living systems, thereby attracting considerable attention to a wide range of applications, including nanotechnology [**1**], biochemical processes [**2**], medicinal chemistry [**3**], industrial catalysis [**4**], and biocatalysis [**5**]. It has been recognized as an essential biological element, playing roles in both catalytic and inhibitory functions in living organisms. Thus, V(V) catalytic activity was tested in well-defined ternary complexes with amino acid derivatives and H_2O_2.

• Materials and methods

All experiments were carried out under aerobic conditions. All solvents, chemical reagents, and standard solutions (acetonitrile, ethyl acetate, acetone, dichloromethane, toluene, n-hexane) used for catalytic analyses were purchased and used further without purification.



N,N-dimethylglycine hydrochloride



N-methylglycine (Sarcosine)

• Results and discussions

The experimental results suggest that the vanadium species (**Fig. 1**) exert catalytic activity (**Fig. 2**), with aromatic hydrocarbons, such as benzene, transforming it in products with high specificity and yield at ambient temperature.

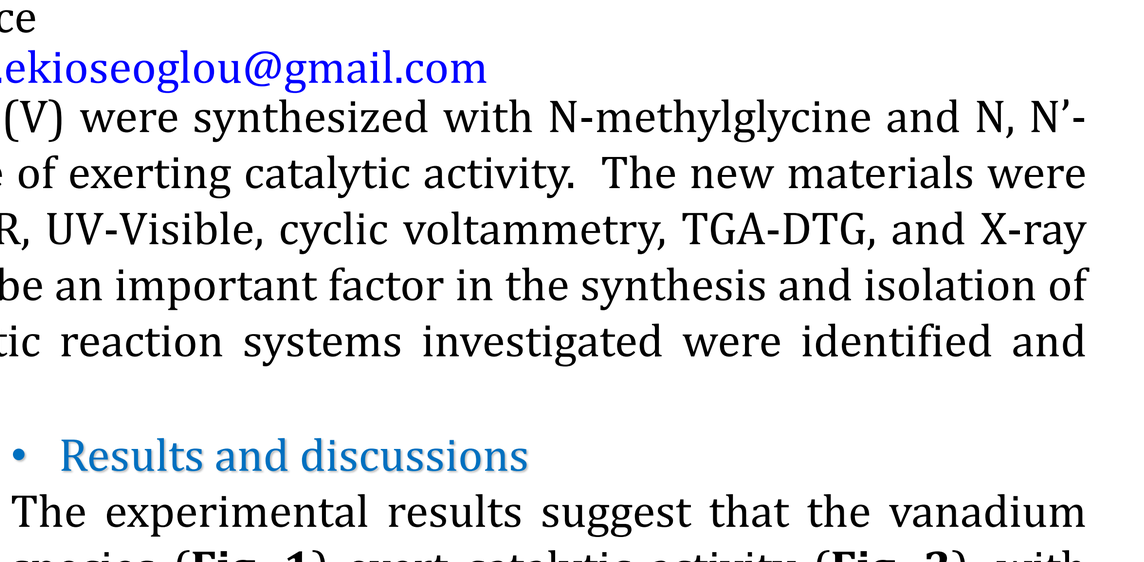


Fig. 1: A. Symmetric and **B.** asymmetric forms of V(V)-compounds

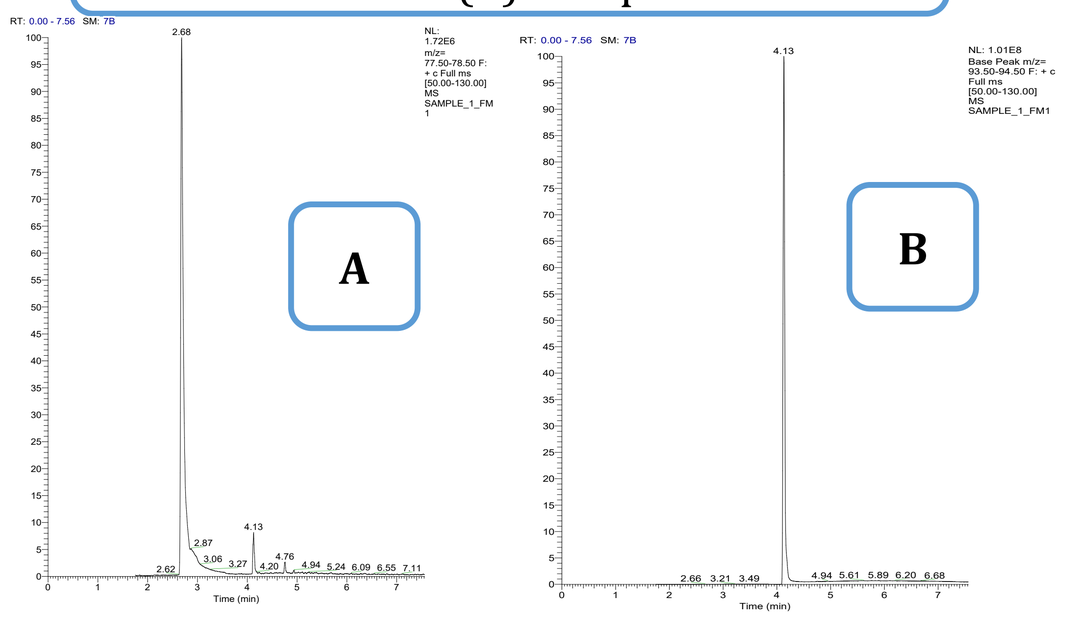


Fig. 2: GC-MS chromatogram of **A.** Benzene, and **B.** Phenol

• Conclusions

The collected data provide a well-defined comparative profile of the catalytic transformations of benzene under ambient conditions, with mechanistic insight into the observed chemical reactivity of V(V).

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