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STRUCTURAL SPECIATION OF Ti(IV)-PEROXIDO-CITRATO COMPOUNDS IN AQUEOUS MEDIA

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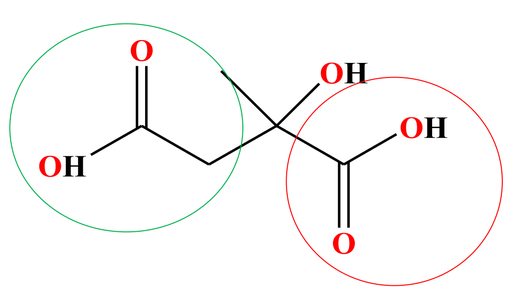
Abstract: Research, carried out in our laboratory, targets the synthesis of peroxido-analogs of metal-organic titanium compounds in an aqueous environment, with the titanium center bound to α-hydroxycarboxylic acids (e.g. citric acid). Introduction of the peroxido group in the coordination sphere of Ti(IV) is intended to confer functional reactivity properties, both in catalytic applications and in biomedical environments, in which ROS formation could be monitored-controlled and toxicity will be reduced or neutralized. The isolated crystalline materials were further characterized through elemental analysis, FT-IR, UV-Visible, FT-Raman, NMR, and X-ray crystallography, with the results meriting due attention toward the atoxicity profile of titanium compounds in an aquatic environment, such as that encountered in human biological tissue fluids.

• Introduction

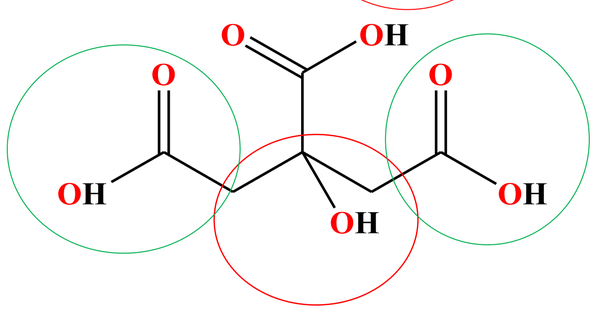
The synthesis of metal-organic compounds, based on titanium, has attracted intense research interest due to that metal ion's unique properties, low cytotoxicity, and significant bioavailability. Titanium has been used in ceramics, retainers, and general materials, applicable to surgical restorations, dental fillings and other applications, mainly in the Ti(IV) oxidation state [**1,2**]. These compounds represent a promising class of hybrid materials, which is not only limited in their materials science but also extends into biomedical applications. To that end, the emerging materials can be used as pharmaceutical compounds (e.g. anticancer drugs, antibiotics) or due to their sensitivity to pH changes, they can transport and release drugs in acidic environments, such as those encountered in tumors or inflamed tissues [**3**].

• Material and methods

Chemicals in this study were used without further purification in the synthesis of Ti(IV) compounds.



Citramalic acid



Citric acid

• Results and Discussion

New Ti(IV)-based metal-organic compounds have been isolated using hydrothermal methods, following the reaction:

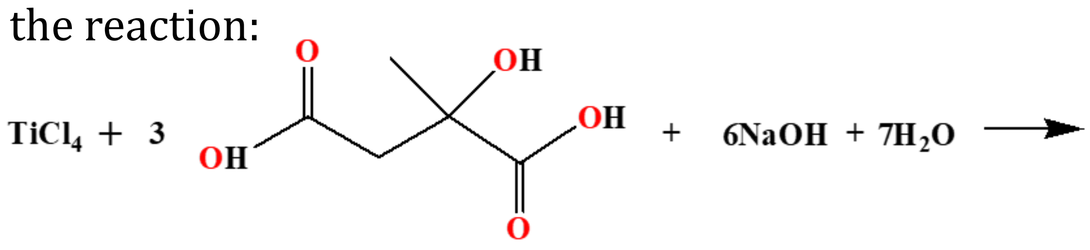


Fig. 1: Comparable FT-IR of Ti(IV)-citramalic with citramalic ligand

All materials have been further characterized through elemental analysis, FT-IR, and X-ray crystallography.

• Conclusions

1. New Ti(IV)-(α-hydroxycarboxylato) materials have been synthesized and characterized through elemental analysis, FT-IR, and X-rays.
2. The compounds merit further consideration in biomedical applications.

References:

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