conferenceseries.com

Nikolay Gerasimchuk, J Material Sci Eng 2018, Volume 7
DOI: 10.4172/2169-0022-C8-112

19th World Congress on

Materials Science and Engineering

June 11-13, 2018 | Barcelona, Spain

Nikolay Gerasimchuk

Missouri State University, USA

Multifunctional materials stemming out of coordination compounds

The definition is: "*materials science* is an interdisciplinary field concerned with the understanding and application of the properties of matter." This area is dedicated to study of connections between the underlying structure of a material, its properties, its processing methods, and its performance in intended applications. Classic understanding of materials traditionally limits them to metals and their alloys [uses in: construction, catalysis, electric/conductance, magnetism], a variety of oxides [refractory materials, catalysts, ceramics/cements, quartz, conductance/semiconductance], thermally stable salts [silicates (including glass), phosphates, binary halides and halcogenides [optical materials, semiconductors], etc. Typically those classic materials are produced in large quantities from thousands- to multi-tons quantities. However, during the last two decades a new type of chemical compounds vigorously claimed a well-deserved place in the vast world of materials. These are coordination compounds. There are two large sub-classes of the Werner-type complexes and organometallic compounds (Scheme 1) with principally very different chemical bonding in them. The first one adopts predominantly ionic/donor-acceptor type, while the latter represent covalently bonded species containing direct metal-carbon bond. Numerous *coordination compounds* of both types were employed as precursors for materials. Most common transformation of complexes includes their thermal decomposition leading to a product/material with desired properties for a specific application. However, only Werner-type complexes can be used as materials because of their stability at ambient conditions. Most of the organometallic species still are intrinsically unstable towards moisture and oxygen. Applications of numerous complexes as materials (and specifically those as multifunctional materials) are reviewed in current presentation. These applications include usage of numerous Werner- type complexes in a variety of MOFs (gas sorption, purification of compounds, delivery), non-linear optical materials (second harmonic generation and optical limiters), catalysts, sensors and indicators, functional supramolecular materials, light harvesting/converting materials, molecular electronics.

Recent Publications

Dr. Gerasimchuk authored and co-authored 112 publications and 7 patents on useful properties of a variety of the obtained compounds. Some representative works are shown below:

1. Cheadle C, Ratcliff J, Berezin M, Pal'shin V, Nemykin V.N., Gerasimchuk N. (2017) Shortwave infrared luminescent Pt-nanowires: a mechanistic study of emission in solution and in the solid state. Dalton Transactions: 46(39), 13562-13581.
2. He S, Toukrakis G, Berezin O, Gerasimchuk N, Zhang H, Zhou H, Izraely A, Akers W.J, Berezin M.Y. (2016) Temperature-dependent shape-responsive fluorescent nanospheres for image guided drug delivery." J. Mater. Chem. C, 4, 3028-3035.
3. Gerasimchuk N. (2014) Synthesis, Properties, and Applications of Light-Insensitive Silver(I) Cyanoximates. Eur. J. Inorg. Chem. 4518– 4531.
4. Gerasimchuk N, Berezin M. Near Infrared Emitters. US Patent Application No. 15/001,023; January 19, 2016.

Biography

Nikolay Gerasimchuk is a Full Professor of Inorganic Chemistry at Missouri State University (USA). His research interests and expertise lay in the following areas: 1) the 1D coordination polymers as cytotoxic NIR emitters for theranostic applications; 2) mixed valence compounds; 3) novel antimicrobials based on silver and antimony oximates; 4) physical methods of investigation of inorganic and coordination compounds, including small molecules crystallography of inorganic and coordination compounds; 5) equipment design for synthetic inorganic/materials chemistry.

NNGerasimchuk@MissouriState.edu

Notes: