Journal of Advanced Materials & Technology
2018, Pages 25-85

Recent Advances in Direct Synthesis of Organometallic and Coordination Compounds

Vidyasagar C. C,[a,b] Blanca M. Muñoz Flores,[a] Víctor M. Jiménez-Pérez.[a,*]

[a] *Universidad Autónoma de Nuevo León, Facultad de Ciencias Químicas, Ciudad Universitaria, Av. Universidad s/n. C. P. 66451, Nuevo León, México.*
[b] *School of Basic Sciences and Research in Chemistry, Rani Channamma University, PB NH-4, Bhutranmhatti, Belagavi 591-156, Karnataka, India.*

* Corresponding author. Facultad de Ciencias Químicas, Ciudad Universitaria, AvUniversidad s/n. C.P.66451, Nuevo Leon, Mexico.
E-mail addresses: victorjimenezpr@uanl.edu.mx (V.M. Jimenez-Perez).
uanl.edu.mx (V.M. Jimenez-Perez). https://doi.org/10.1016/B978-0-12-811061-4.00002-5

ABSTRACT

In recent years (1980-2016) literature on "direct synthesis" of both coordination and organometallic compounds through interaction of metallic elements with organic substrates (ligands) present in a solid as well as liquid assistant grinding (LAG) phases have been reviewed. The synthesis of organometallic and coordination compounds, particularly heterometallic coordination compounds, remain a challenge for modern chemistry. Spontaneous self-assembly (SSA) is a primary approach that proceeds by broad screening, typically with simple, flexible ligands and available metal salts. The "direct synthesis" (DS) is a class of SSA, but prescribes the use of zero-valent metal(s) as a starting material, typically forces deprotonation of the protic ligand(s) with the formation of unexpected products. The direct synthesis is successfully applied in preparation of heterometallic complexes. The aim of this review is to provide a broad but digestible overview of direct synthesis, *i.e.* reaction conducted by grinding solid reactants together with no or negligible amount of solvent. We summarize our experience of complied data in the field of "direct synthesis" of heter-organometallic complexes with respect to the corresponding yields, covering preparative characterization and structural aspects.

Key words: Direct synthesis, Main group elements, Organometallic, Photophysical, Yield

1. Introduction

In current years, alkali metals have attracted growing attention as they find application in numerous fields. The background to these applications understanding is a deep knowledge of the chemistry of the elements. Many metal-containing compounds have been utilized throughout the history to treat a wide variety of disorders. Regulation of such reactivity through alkali and alkaline earth metal cations complexation plays vital role in many industrial applications. Such applications-oriented studies have now been extended to alkali and alkaline earth metal chemistry. Inorganic compounds should consequently not be ignored, since their distinctive electronic, chemical and photophysical properties render them particularly useful for the variety of applications. Because inorganic elements encompass the bulk of the periodic table and covers broad choice of applications based on the particular properties such as charge, interaction with ligands, structure and bonding, Lewis acid character, partially filled d-shell, and redox activity. This is by no mean a comprehensive property, but rather a primary to highlight important subjects. Some metals are stable in aqueous solutions as cations, ideal for maintain charge balance. It is generally accepted that compounds containing at least one carbon atom and no metals are classified in the area of organic chemistry.

2. Materials and Methods

3. Results and Discussions

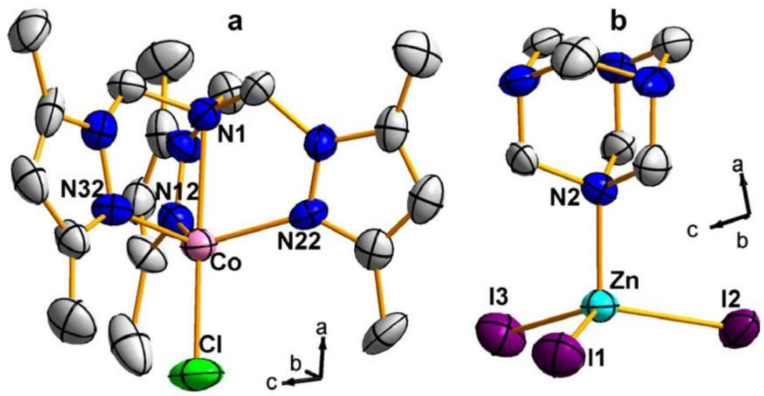

Fig 1. Coordination sphere of (a) cobalt(II)ion (b) zinc(II) ion in $[CoClL^1][ZnI_3L^2]$.

	Rub^{1-}/Cs^+ 1.6THF $0.2C_6H_{14}$	1.5 $Rub^{2-}/2Cs^+$ .DMF 0.5C6H14	$Rub^{4-}/4Li^+$ .8THF	$Rub^{4-}/4Rb^+$ .5THF
Empirical fromula	$C_{49.60}H_{43.60}CsO_{1.60}$	$C_7H_{59}Cs_3O_2$	$C_{74}H_{92}Li_4O_8$	$C_{62}H_{68}O_5Rb_4$
M_r[b mol^{-1}]	798.15	1330.9	1137.24	1235.04
Space Group	$P2_1/n$	PI^-	PI^-	PI^-
a [Å]	13.97	13.338	10.866	13.482
b [Å]	10.2594	14.189	12	14.092
c [Å]	26.115	16.036	12.88	17.194
Crystal system	monoclinic	triclinic	triclinic	triclinic

Table 1. Summary of crystal and refinement data for rubrene with alkali metals

4. Conclusion

The main goal of this review is to encourage researchers dealing with the spontaneous self-assembly of metal complexes to expand their studies to the Green Synthesis of coordination compounds is also called as “Direct Synthesis” (DS). The DS approach involves the use of at least one zero-valent metal as starting material. After two decades of studies, the direct synthesis approach has proved its efficiency, being able to generate coordination compounds of unusual structures and nuclearities. The DS approach has been shown to be successful for the preparation of heterobi- and heterotrimetallic coordination compounds.

5. Acknowledgment

6. References

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