



48ª
Reunião Anual da
Sociedade
Brasileira de
Química

Emergências Climáticas?
A Química Age e Reage!

ANais

08 a 11 de junho de 2025, Campinas, Expo Dom Pedro

SOCIEDADE BRASILEIRA DE QUÍMICA

Anais da 48^a Reunião Anual da SBQ



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Reunião Anual da
Sociedade
Brasileira de
Química

Campinas-SP
2025

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Dados Internacionais de Catalogação na Publicação (CIP)
(Câmara Brasileira do Livro, SP, Brasil)

Reunião Anual da SBQ (48. : 2025 : Campinas, SP)
Anais da 48ª Reunião Anual da SBQ [livro
eletrônico] / Sociedade Brasileira de Química. --
1. ed. -- Campinas, SP : Apor Software, 2025.
PDF

Vários autores.
Vários colaboradores.
Bibliografia.
ISBN 978-85-63273-70-3

1. Química I. Sociedade Brasileira de Química.
II. Título.

25-282696

CDD-540

Índices para catálogo sistemático:

1. Química 540

Eliete Marques da Silva - Bibliotecária - CRB-8/9380

A Dinuclear Aluminium Complex as a Promising Precursor for Fluor-18/Aluminium Radiopharmaceuticals

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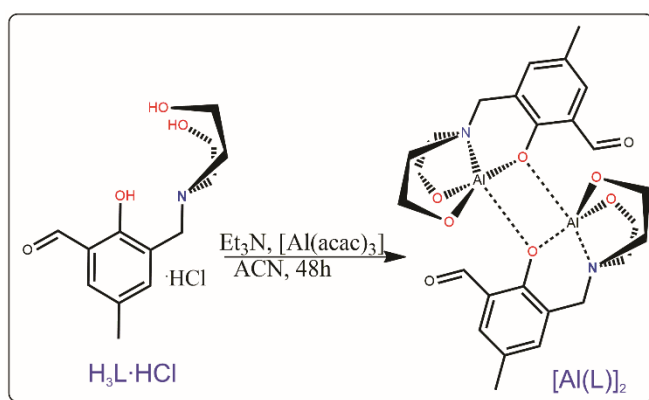
Keywords: Aluminum, Dinuclear Complex, Metalloradiopharmaceuticals, Radiohalogen, Chelating Agent.

Highlights

The dinuclear complex $[Al(L)]_2$ was synthesized and characterized using FTIR, NMR and MALDI-TOF, with an emphasis on its structural and spectroscopic properties, targeting applications in nuclear medicine.

Abstract

Aluminum(III) compounds have been extensively studied as a carrier of $^{18}F^-$ in positron emission tomography (PET) due to the high bond energy of Al-F ($675 \text{ kJ} \cdot \text{mol}^{-1}$) and its remarkable stability. In recent years, the labeling of Al- ^{18}F with well-known chelators such as NOTA and NODA [1] has emerged as a successful alternative to replace radioisotopes like Ga-68 or Cu-64, considering the short half-life and high cost of these isotopes, respectively. Within this context, this work aims to synthesize an aluminum complex as a precursor for metalloradiopharmaceuticals of the type $[Al^{18}F]^{2+}$. In this study, a dinuclear compound with the general formula $[Al(L)]_2$ was synthesized from $[Al(acac)_3]$ and H_3L , and characterized (**Scheme 1**). The compound was characterized using FTIR, NMR (1H , ^{13}C , ^{27}Al), and MALDI-TOF mass spectrometry. The FTIR spectra revealed the absence of characteristic bands corresponding to the acetylacetonato ligand, indicating that only the L^{3-} ligand is coordinated to the Al^{III} center. The 1H NMR data confirmed the proposed structural formula, with integration matching the expected number of protons. The ^{27}Al NMR spectrum exhibited a chemical shift at 18 ppm, suggesting a pentacoordinate environment for the aluminum ion [2]. The MALDI-TOF spectrum showed a peak at m/z 576.505, corresponding to the dimeric form $[Al(L)]_2$, with fragmentation of the aldehyde group and the presence of acetonitrile and potassium. These results confirm the formation of the dimeric complex $[Al(L)]_2$, highlighting its potential as a precursor for aluminum-based metalloradiopharmaceuticals with applications in nuclear medicine.



Scheme 1. Synthesis of the aluminium(III) complex $[Al(L)]_2$.

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[2] ULICNA, K.; STEPANKOVA, H.; RIMAL, V. NMR Study of Aluminium Coordination in Clays. *Applied Clay Science*, 104-109, 2013.

Acknowledgments

The authors acknowledge CNPq, CAPES, FINEP and FAPESP for financial support.

48ª Reunião Anual da Sociedade Brasileira de Química: "Emergências Climáticas? A Química Age e Reage!"