



ISSN 0975-413X
CODEN (USA): PCHHAX

Der Pharma Chemica, 2021, 13(11): 46-53
(<http://www.derpharmachemica.com/archive.html>)

Environmentally Green Synthesis of α -aminophosphonates

Rahul Patil^{*1}, Shivaji Burungale¹, Uday Lad¹, Uttam More²

¹Department of Chemistry, Yashwantrao Chavan College of Science, Karad. Maharashtra, India

²Sadguru Gadage Maharaj College, Karad, Maharashtra, India

***Corresponding author:** Rahul Patil, Department of Chemistry, Yashwantrao Chavan College of Science, Karad. Maharashtra, India,
E-mail: rspatilorg@gmail.com

ABSTRACT

One pot multicomponent condensation of aldehyde, amine and diethylphosphite for the synthesis of α -aminophosphonates catalysed by environmentally green EPZG catalyst was found to be efficient and direct protocol under solvent free condition at room temperature. The green process offers advantages such as simple work up procedure, shorter reaction time, high yield and reusability of the catalyst.

Keywords: α -aminophosphonates; environmentally green; EPZG; diethylphosphite

INTRODUCTION

Organic chemistry deals with study of C-C bonds and a few compounds carry C-P bonds. Organo phosphorous compounds are made from the Phosphorous naturally or synthetically [1]. Attraction of the chemists increases towards these compounds due to their antibacterial, antimicrobial, antiviral, enzyme inhibitory properties and plant growth regulators, anti-cancer, [2-6]. The innovation of the amino phosphonic acid and other biologically active compound has wide purpose in agricultural and medicinal field [7-9]. Some organophosphorous compounds are key for pesticides [10], bactericides [11-13], α -pyrones analog of phosphorus act as HIV protease inhibitors [14]. Among the organo phosphorous compound α -aminophosphonic acid is significant motifs due to structural similarities with α -aminoacids [15-16]. The majority of the ester and acid derivatives of α -aminophosphonic acid has demonstrate advanced biological activity such as herbicidal and anticancer [17-22].

Kabachnik M. [23-25] and Fields E. [26] reported primary synthesis of α -aminophosphonic acid by the route of condensation of aldehyde or ketone with amine and dialkyl phosphate, latter on many reported technique used for the synthesis of α -aminophosphonates such as Indium triflate and Ytterbium triflate [27], gallium triiodide [28], VCl_3 [29], silica sulfuric acid [30], copper salt [31], tetramethylguanidine [32], samarium di-iodide [33], lithium perchlorate [34], organocatalyst (R)-3,3' [4-fluorophenyl]₂-1,1'-bisnaphthol phosphate [44], ionic liquid media [bmim][PF₆] [35], Amberlite-IR 120 [36], L-Lactic Acid [37], $\text{ZrOCl}_2 \cdot 8\text{H}_2\text{O}$ and $\text{ZrO}(\text{ClO}_4)_2 \cdot 6\text{H}_2\text{O}$, diterpinic dehydroabietylamine [38] Nickel (II) chloride Hexahydrate, N,N'-dioxide-Sc (III) complex [39], $\text{Mg}(\text{ClO}_4)_2$ or molecular iodine [40], InCl_3 [41], Montmorillonite KSF, Amberlyst-15 and Amberlite-IR 120 [42], microwave irradiation [43]. But, one pot multicomponent synthesis of α -aminophosphonates reported methods have drawbacks like long reaction time, use of organic solvent, reactivity with catalyst, complicated separation procedure. To overcome this drawback, here in we have reported the synthesis of α -aminophosphonates by the application of environmentally benign inorganic, heterogeneous EPZG as a clay catalyst having Lewis acid and Bronsted acidic property. Envirocat EPZG^R synthesized and supplied by Contract Chemicals, UK [44-54].