

D-Limonene: Different Areas of Application

Sadi. Meriem^{1*}, Azri. Yamina Mounia¹. Tou. Insaf¹

¹ Centre de Développement des Energies Renouvelables, CDER, 16340, Algiers, Algeria

*Corresponding author's email: meriemcder@gmail.com

ABSTRACT

D- limonene is a green solvent that constitute 97% of essential oil extracted from citrus peels, its application seems to be interesting since it is issued from a renewable sourcen, nontoxic and could replace one than more harmful organic solvents. According to research works, it could be applied in numerous field. Indeed, we conducted a study to replace the organic solvent acetone by limonene to regenerate Granular activated carbon exhausted with phenol.

Keywords: limonene, green solvent, nontoxic, application.

1. Introduction

Limonene is one kind of common inartificial monocyclic monoterpene, it is listed in the Code of Federal Regulation as Generally Recognized as Safe (GRAS) [1], and is abundant component of essential oil issu from citrus fruit rinds [2]. Fossil derived organic solvents are generally toxic, the reason why limonene as biosolvent has emerged because of its cleaner and degrader qualities were recognized and taken into consideration [3]. Biosolvents are solvent obtained from renewable raw materials with the potential of being used without the need to modify. The use of limonene as solvent offers the benefit of lower toxicity, flammability and environmental risk as compared to conventional solvents [4]. D-limonene constitutes the object of study of numerous research works (Fig 1) and could be introduced in several fields such as cosmetic, manufacturing of biopolymers, medecines and food industry. The main objectives of this work are, first to investigate and collect information and to gather them as a review concerning the different domains were d-limonene could be implemented as a green solvent to substitute organic solvents. Secondly, the results of an activated carbon regeneration study using d-limonene to replace an organic solvent are presented [5].

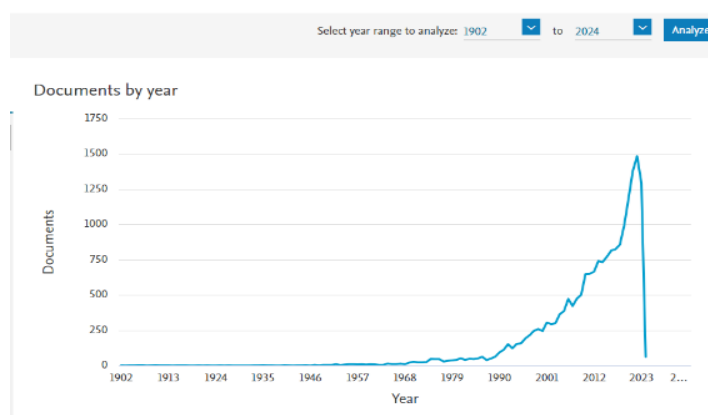


Figure 1: Research works about d-limonene by years (source: SCOPUS)

2. Results and Discussion

Studies on limonene affirmed that it has a good effect against food born bacterial and fungal pathogens, including *Aspergillus niger* and was also regarded as the most potential monoterpene against *Candida* species [1]. This green solvent has proven its effectiveness to provide a wide range of antibacterial, antioxidant and hydrophobic and chemotherapies properties. It is considered as suitable because it is nontoxic [6]. Due to its lemon like odor and rich flavor profile, limonene has been used widely in cosmetics in the products like perfume, soap and in food and drink



industries. It is used also in house hold products like detergent and cleaning agent, and applied as a solvent for industrial cleaning and decreasing agents in place of harmful agent [7]. Furthermore, Several studies have evidenced the potential of using limonene in lipid extraction [4]. On our side, limonene was used to regenerate granular activated carbon saturated with phenol [5], the effect of experimental conditions was studied, the obtained results using d-limonene show lower efficiency comparing to acetone. However, mixing d-limonene with acetone seemed to be more effective, the percent desorption reaches 85 using 100 ml of acetone/limonene mixture (80/20 vol%), indicating that organic solvent could be replaced at least partially by the green solvent.

3. Conclusions

This study shows results of several studies indicating that limonene could be applied in numerous fields, this green solvent is extracted from citrus peels contributing thus to waste recovery.

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