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# Application Of Agro-industrial Waste as Adsorbents for Removing Emerging Pollutants

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**Abstract**

Agro-industrial waste, due to its advantage over other materials, such as its abundant disposal, renewable characteristic and low cost, has been arousing interest as an option in the production of alternative adsorbents. Adsorption is a simple process, it removes or minimizes different types of pollutants and does not require high costs, due to the low (or not) need for energy and the possibility of reusing coal through its regeneration.

**Keywords:** Agro-industrial waste; Adsorption; Low cost

## Introduction

One of the environmental problems with the greatest impact today is the solid waste issue. With the existing world population, approximately seven billion people, the work in the countryside was replaced by industrial work, causing half of this population to seek their livelihood in the big cities. By 2030 the urban population could reach five billion inhabitants, representing about 71.43% of the actual world population [1,2].

Due to population growth and increased industrial activity, environmental problems have become increasingly frequent and worrying [3]. According to the 2016 State of World Population report, a global population of 9.3 billion is expected in 2050. Along with population growth, problems are emerging that most cities in underdeveloped countries live with, including poverty. crime and inefficient, or even non-existent, environmental sanitation [1].

On the other hand, in underdeveloped countries, the problem with waste is accentuated not only due to population growth but it is also helped by the disorderly occupation of land, inefficient environmental control, and lack of governmental intervention. Brazil is an example in this scenario, being one of the main generators of agro-industrial waste [4]. According to data from the Ministry of the Environment, each year around 290.8 million tons of waste are produced in Brazil in this sector alone [5]. The patterns of production, consumption and form of capital reproduction bring up the issue of solid waste.

The evolution of technology developed by man has caused an excessive consumption of natural resources and ends up generating a high load of waste, which end up having a direct impact on the environment [4].

The biggest challenge today is to find a balance between the generation of waste and its final disposal. The amount of waste produced has been growing as the world population grows and also as inadequate management is used and a lack of areas for proper final disposal [6]. The use of renewable materials has become an accessible option for the correct allocation of waste generated by industries. This reallocation involves technological innovation, using agro-industrial residues in an alternative way.

The development of alternative adsorbents is attractive, as the national production of this type of material is insufficient for its needs, and this product has to be imported. The attraction of the consumer market is also notable, since adsorbents can be used efficiently in environmental terms in various decontamination processes, and can be used in water supply companies, pharmaceuticals, gas transport, among others [7,8]. The use of adsorbents obtained from agro-industrial waste becomes an accessible technology for environmental control, as it seeks to minimize the cost/benefit ratio of a process that employs alternative adsorbents, using low-cost raw materials [7].

### Adsorbents formed from agro-industrial waste

The adsorbent is a material with a porous structure, with or without oxygen bound to carbon atoms [9]. They are solids without defined forms, in the form of powder or granules, processed to develop internal porosity, increasing the pore volume, consequently the surface area [10]. Adsorbents are obtained through a carbonization process, where the material is pyrolyzed at high temperatures.

Most carbonaceous materials have some porosity and high surface area [11]. Thus, the porosity of the adsorbent will depend on its precursor material and the activation method used, which can be physical or chemical activation. However, some materials can generate adsorbents with relatively high efficiency (greater than 90%) without the need for activation, reducing costs with reagents, energy and equipment [12]. In this context, adsorbents, due to their surface area and adsorption capacity, have great applicability for removing contaminants. Figure 1 shows a list of residues used in the literature for the removal of emerging pollutants.

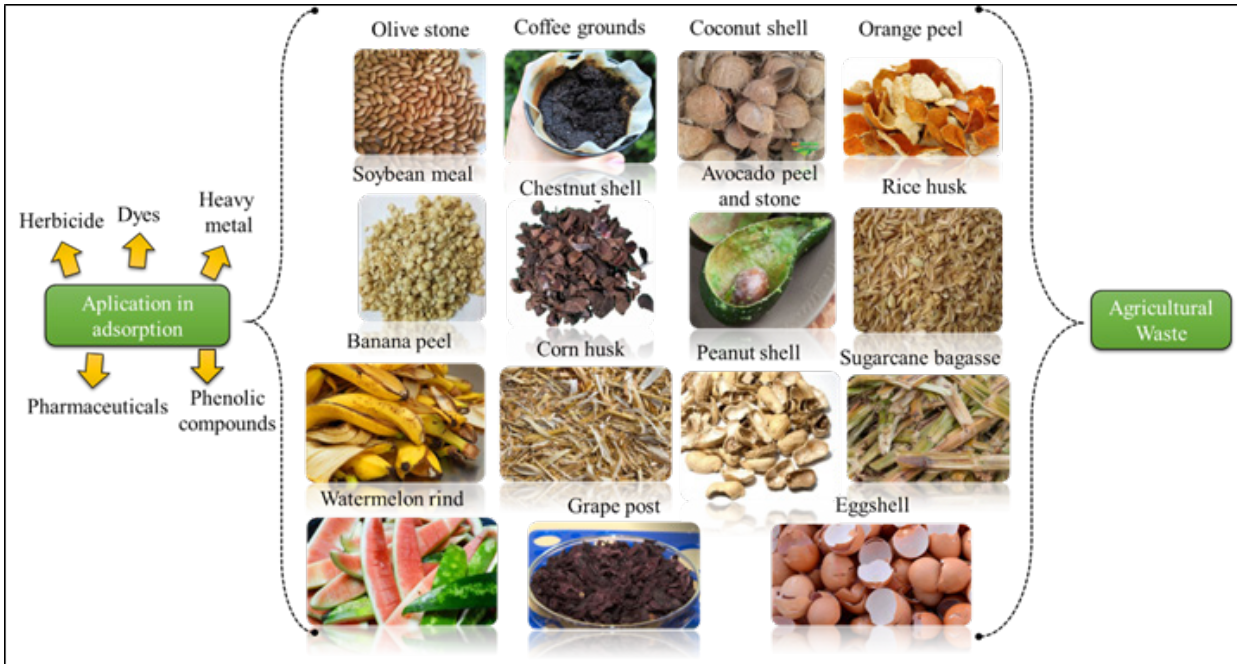


**Figure 1:** Illustrates the diversity of waste applied in the adsorption of different pollutants.

## Conclusion

In this context, the use of agro-industrial residues becomes an efficient alternative for the production of alternative adsorbents, promoting the conversion of an agro-industrial residue into a low-cost and considered effective adsorbent.

## References

1. Mcginn T, Garfield R, Friedman H, Mahon J, Snow R, et al. (2015) Shelter from the storm. A transformative agenda for women and girls in a crisis-prone world.
2. Pinheiro RF (2011) Economical and productive support, factors of intellectual man development. Abstract: Montes Belos Coll Mag, pp. 1–20.
3. Alkaher I, Carmi N (2019) Is population growth an environmental problem? Teachers' perceptions and attitudes towards including it in their teaching. Sustainability 11(7).
4. World watch Institute (2015) State of the World 2015, Island Press/ Center for Resource Economics, Washington, DC, USA.
5. (2012) National Solid Waste Plan, Brazil.
6. Jacobi PR, Besen GR (2011) Solid waste management in São Paulo: The Challenges of sustainability. Adv Stud Online J 25(71): 135-158.
7. Franco DSP, Dotto GL (2020) A short analysis of biosorbents and its potential removal contaminants from aqueous media. Global Journal of Engineering Sciences 5(2): 1-3.
8. Dotto GL, McKay G (2020) Current scenario and challenges in adsorption for water treatment. J Environ Chem Eng 8(4): 103988.
9. Nigam P, Armour G, Banat IM, Singh D, Marchant R (2000) Physical removal of textile dyes from effluents and solid-state fermentation of dye-adsorbed agricultural residues. Bioresour Technol 72(3): 219-226.
10. Spinney J (2012) Tim Cooper (ed.) Longer lasting products: Alternatives to the throwaway society. J Consum Cult 12(1): 110-112.


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11. Lima EC, Royer B, Vaghetti JCP, Brasil JL, Simon NM, et al. (2007) Adsorption of Cu(II) on Araucaria angustifolia wastes: Determination of the optimal conditions by statistic design of experiments. J Hazard Mater 140(1-2): 211–220.

12. Da Rocha WD, Da Luz JAM, De Lena JC, Bruña-Romero O (2006) Copper adsorption by activated carbons from macadamia nut and guava seed endocarp. Mag Sch Mines 59(4): 409-414.


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