



USES OF ACTIVATED CARBON IN MEDICINE AREA: SHORT REVIEW

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ABSTRACT

Activated carbon which usually we said charcoal is one of effective & significant powder & granular form which was used in several fields of life either it is medical field, cosmetic or any other their effectiveness was significant. The uses of activated carbon in medical fields are vast. It was used in the cure of many illnesses like gas problems, skin issues, teeth problems, and deodorant. Here, we discuss the significance of activated carbons & their application in different fields.

KEY WORDS: Activated charcoal, absorption, uses and application, medicine

INTRODUCTION

Odorless, fine powder which is black in color known as activated charcoal effectively used to cure overdose in emergency rooms¹. Activated charcoal possess lots of medicinal & other characteristics which shows their effectiveness in several fields in which includes cosmetics & many more². One of the effective characteristics of activated charcoal showed toxin absorbing activities³. The other name of activated carbon was charcoal vegetable, carbon vegetable, de noir lamope, de gaz noir, charcoal medicinal, black lamp, black gas, charcoal, active vegetal charbon, vegetal charbon, medicinal carbon, animal charbon, active charbon, actifcharbon, activado carbon, carbon, and vegetabilis carbon⁴. Usually activated charcoal obtained from petroleum, shells of coconut, wood, peat, coal⁵, agricultural wastes⁶⁻⁸. The characteristics of both common & activated charcoal are same and effectively used as a medicinal purposes⁹. The formation of activated charcoal done after heating the common charcoal in the existence of gas which causes charcoal to produce pores & inside spaces so, with the help of these pores, the trapping of chemicals occurs through activated charcoal¹⁰. In medicinal point of views, it effectively cures the flatulence, poison, cholestasis, reduce the level of cholesterol & effective in pregnancy¹¹. Those substances which present in burnt food pieces & bricks are not which found in activated charcoal¹². Activated carbon manufacturing is good which enhance adsorbent properties and easily bind with atoms,

ions & molecules (from the dissolved components the removing of this substance occurs easily). The manufacturing of activated charcoal occurs at high temperature¹³.

In this work, the uses of activated carbon in medicine area were highlighted based on the literature. The properties of obtained activated carbon, produced by using various precursors under carbonization, and activation process, were discussed.

MECHANISM OF ACTION

The mechanism of activated charcoal involves in this rich material of carbon like wood at high temperature charcoal obtained. After obtaining the charcoal, activated charcoal will be generated through several processes. In this process, includes carbon dioxide, acids, steam and oxygen activation process. After passing through all activation processes, all impurities are removed and formed porous black granules. On the particles of charcoal, it forms lots of holes, as a results, the surface area increases. Sometimes, chemical activation process could be carried out by using phosphoric acid, sulfuric acid, nitric acid, FeCl₃, CaCl₂, NaOH, KOH, zinc chloride¹⁴⁻¹⁶. Due to their effective adsorbent features, activated carbon usually traps a lots of chemicals and toxins. Activated charcoal possess porous structure which helpful due to its negative electrical charge. It pulls gases & toxin which are positive charged. Then, these molecules trapped into activated charcoal and prevented the adsorption of toxins into the blood-stream. In human body, the



absorption of activated charcoal is not occurring. So, extraction of this occurs with the toxins adsorbed¹⁷.

MEDICINAL USES OF ACTIVATED CHARCOAL

Role of activated charcoal in both acute & chronic health related problems are very effective. Their uses we discussed one by one in this article

Infection of skin

In case of skin infection, the role of activated charcoal is significant in all over the world. Several traditional practitioners of medicine use the powder of charcoal which derived from the shells of coconut effectively heal the soft skin tissues which are infected. It possesses anti-bacterial properties which absorbs dangerous microbes from the infected area¹⁸. Researcher reported that activated charcoal peel off mask could be used to enlarge the pores, remove dead cells and impurity

from the skin¹⁹. Other beneficial such as soaking up excess oil (due to the overproduction of sebum in particular people) and brighten dry skin (on the skin of the hands).

Deodorant

In all around the world the availability of activated charcoal deodorant is quite common. The function of activated charcoal is that this material absorbed effectively dangerous gases and smells like some deodorant used in refrigerator, shoe & under-Aram. At micro level, these activated charcoals effectively absorb the moisture and control the level of humidity²⁰. Generally, charcoal deodorant replaced aluminium (caused adverse reaction such as skin irritation) in order to block odor and absorbed sweat effectively. Currently, we can buy several charcoal deodorants in the market due to it is safe (Table 1). Coconut husks, sawdust and olive pits could be used to produce activated charcoal.

Table 1: Charcoal deodorants in the market (Is charcoal deodorant good your questions answered)²¹

Product name	Description
Schmidt's charcoal and magnesium charcoal deodorant	Ingredient contained coconut oil, essential oils, vitamin E, jojoba and shea butter All day protection for both men and women.
native charcoal deodorant	Ingredient contained baking soda, shea butter, magnesium and coconut oil. It works like ocean-fresh, non-greasy application with no residue.
Piperwaiactivated charcoal natural deodorant stick	Suitable for both women and men. It is vegan, parabe-free, and aluminium-free.
Dr Teal's aluminium free deodorant with charcoal	Ingredients contained baking soda, magnesium, essential oils and arrowroot powder. It absorbs wetness and block odor all day based on the dermatologist-tested. It is paraben free and phthalate free.
Duke Cannon Trench Warfare natural charcoal deodorant	Formulated for hard-working men It is alcohol-free, aluminium-free and naturally derive
CLEO +COCO Women natural deodorant with activated charcoal	Formulated for women for all day odor control It is no synthetic fragrances and aluminium-free product. Ingredient contained activated charcoal, clay, essential oils, and plant based powders

Skin care

The role of activated charcoal significant in case of skin related problem. It prevents skin from harmful chemicals, dust, bacteria, toxins, dirt and micro-particles. So, it acts as a protective for skin²². Generally, activated charcoal was excellent for most skin types, and therefore could be used to improve

acne, ditch the itch, heal damaged skin, and minimize pores. Nowadays, many consumers purchased activated charcoal mask based on their skin care needs (Table 2). Charcoal can suck out dirt and oil from pore surface, make it cleaner feeling and less oily skin. However, consumers are advised to use once each week unless notice dryness and sensitive skin.

**Table 2: Charcoal masks in the current market**

Sephora collection the charcoal mask	Based on the dermatologically test, charcoal mask can clean old make up and such excess oil as little as 15 minutes.
Clinique city block purifying charcoal clay mask+scrub	The best exfoliating charcoal mask to remove oil.
Honua Hawaiian skincarAina detoxifying mask	It could be used to help fade dark spot and brighten skin tone. This mask was formulated with bamboo charcoal, and plant derived ingredients will leave skin moisturized.
PCA skin detoxifying mask	This mask can absorb excess dirt and debris trapped deep in the pores.
Origins clear improvement charcoal honey mask	Key ingredient is bamboo charcoal. It nourishes skin and could be used once a week.
Beneath your mask illuminate clarifying face mask	Formulated with coconut charcoal, it achieves smooth, radiant, soften and brighten skin.
Ulta detoxifying charcoal deep cleansing clay mask	The mask can be applied for acne-prone and oily skin, however, not for use on sensitive skin.
BosciaLuminizing black mask	Charcoal can absorb excess oil, reduce the look of pores and banish blackheads.

Oral health & whitening of teeth

From the research and experiment, it was confirmed that almost all the whitening teeth products contained activated charcoal. Most of oral products for health also showed the presence of activated charcoal due to anti-bacterial, anti-viral, anti-fungal & detoxify²³. As reported by scientists, several advantages of activated charcoal in toothpaste have been highlighted including may improve bad breath, prevent staining and remove surface stains on teeth²⁴.

Diarrhea

Activated charcoal effectively used in the cure and management of diarrhea because it effectively acts as poison & overdose absorbent in gestor-intestinal. From the study, researchers have concluded that activated carbon has potential to stop bacteria and those drugs which increase the chances of diarrhea²⁵.

Filtration of water

The uses of activated charcoal increased with the passage of time. From the research, it was concluded that those people who used activated charcoal from long duration prevented from many health-related problems. Activated carbon is good water natural filter. It not only prevented stomach and intestine problems, but also showed interaction & absorbent effects for drugs, toxins, bacteria, viruses, chemicals & fungus, which present in water. The uses of activated carbon significant were observed in the center of waste management and for the filtration process²⁶.

Flatulence

In case of intestinal gas, the role of activated charcoal is very important (powder form). These gases and liquid easily pass from the holes of activated carbon. From the experimental results, it was confirmed that 448mg of adsorbent, 3 times for two days effective²⁷.

Kidney health

The role of activated charcoal in case of kidney related problems are significant because it filters the un-digested drug & toxins. The effectiveness of activated carbon also seen in removing the toxic products from the urea. In case of chronic kidney disease, the role of activated charcoal effective reduces the inflammation²⁸.

Other medical uses

The use of activated charcoal in emergency room was very effective. The doctor uses this material to reduce the toxins & other dangerous particles and drugs (sedatives, NSAID, anti-inflammatory, dapson, CCB blockers of calcium channels, carbamazepine, medication of malaria, methyl-xanthine's). Research findings revealed that it also decreases the level of cholesterol & prevent from hang over during pregnancy²⁹⁻³¹.

APPLICATION OF ACTIVATED CHARCOAL

Activated charcoal possess good capacity for adsorption, shows polymodal structure & most potent & versatile agent for adsorption because of surface area is large & the composition of chemical is variable. Therefore, activated carbon possess lots of applications. In case of gas phase



application, the use of activated carbon could be seen in either granules or free dust pellets. The adsorption capacity & micro-porosity for organic vapors & gases are selective developed good with 1000 to 2000 surface area. The activated carbons possess good adsorption capacity/unit volume with good retention capacity, decrease resistance capacity for the flow of gas, in the existence of moisture agent gases adsorption preferably high & at given pressure (decrease) & temperature (increase) the release of complete adsorbates seen. In the gas phase, the consumption of activated carbon is less compared to liquid phase because of there are less application for large volume & usually the consume carbon re-generated. Further, researchers have reported that the carbon which used in gas phase application was expensive than those carbons which used in the liquid phase. The obtained activated carbon produced by using coal, pits fruit & nut-shells could be employed in gas phase application. The important application of this phase usually depends on the adsorption ability of vapors & gases which based on the shape & weight of molecules (allow this to separate it from gases & air). There are several forms of the obtained carbon such as cloth, pelletized, and granular form. These carbons were used to decrease those gases which are pollutant & exist in decrease concentration. Activated carbon in most of the cases become highly micro-porous which usually maximize the vapors and gases adsorption on micro-pores. Some of the important method which used in activated carbon for the purification of gas including sulfide of hydrogen, the function of this method is to remove the gas which naturally exist & in the conditioning system of air filtering, the breathing air by doing this it not only removes the odors but also radon, sulfur dioxide retention & retention of oxides of nitrogen from the gas flue (done recovery of gasoline). In activated carbon, one of the significant applications is the separation of gas. Nitrogen is produced from the air separating component. Swing pressure adsorption method is one of the effective methods for the gas separation. Activated carbons possess large adsorptive capacity. In case of solvent recovery applications, activated carbon stops the release of organic volatile components, in economic point of view, the reformation of solvent is very significant in several fields. In solvent recovering from the streams of air, the role of activated carbon is significant and it possesses lots of advantages on condensation & scrubbing water. The used of activated carbon in different fields such as coating industries, manufacturing of solvents, adhesives, rubber, printing, synthetic fiber, petro-chemical and paint. Usually, the solvent which recuperate from activated carbons including xylene, tetra-hydro furan, pentane, ether ethyl, ethanol, toluene, benzene, acetone, aromatics and hydrocarbon chlorinated. In some cases, the activated carbon was used to recuperate some heavy vapors such as cyclohexane and cumene. Boiling point and solvent size are the function of activated carbon, can enhance the adsorption capacity.

In general, higher the boiling points and molecular weight of gases, activated carbon adsorption properties increased (below 40 °C). The tri-methylamine and mercaptan methyl are the example of low boiling point. Arsine (highly toxic gas) and sulfide of hydrogen usually not absorbed directly on activated carbon. The important use of impregnated activated carbon is the light gases removal which not only control the toxic but also control the odor of gases in the treatment of sewage plants, and mills pulp. Mercaptans & sulfide of hydrogen can be fixed (as sulfides) via impregnation agent such as NaOH, KOH, copper sulfate and lead acetate. The other application of gas phase includes radionuclides & krypton from the power nuclear plants it stops the emission of gases. In case of liquid phase applications, activated carbon was used in both powder & granular form. In re-generation process, the granular form of activated carbon is used but in batch process activated carbon was employed in the powdered form. The requirement of activated carbon in liquid phase applications (colour and odor removal, solute recovery, removal of taste) should have more pore size as compared to gas phase application. Generally, these carbons were prepared by the activation of chemical of lignite, peat and wood. Treatments of water (accounted for 70% of wastewater treatment) is one of the important applications in liquid phase. The used of activated carbon in the primary cure is very effective also facilitate the process of other purification. In the treatment of water, activated carbon used in both granular & powder form. and the re-generation capability presents in granular activated carbon. To remove and manage the unpleasant odor and taste, removal of organic component from the drinking water all done by using activated carbon. Activated carbon in powdered form, then added into water in slurry & after that by the process of filtration and clarification it removed. The dosage of activated carbon usually relays on the type of carbon. Their taste and odor but mostly the dosage of activated carbon is low. Usually the important use of activated carbon in granular form is remove the organic component in which includes tri-halomethanes, chloroform, unpleasant odor and taste. The use of activated carbon also could be seen in the industrial wastewater treatment because of activated carbons have capability for the adsorption of different pollutants (derivatives of hydroxyl, phenols, solvents of chlorine, soluble dyes, detergents, aromatic component & hydrocarbons). The use of activated carbon also could be observed in various applications such as mills of paper, pulp, plants fertilizer, dyeing fabric, factories for rubber thread. The role of activated carbon in the beverage and processing of food, for the removal of contamination is significant, in this the process of applications includes soft drinks, yeast, syrup maple, alcoholic beverages, fats & oil vegetables, sugars, honey, fruit juices & sweeteners. The role of activated carbon in pharmaceutical & chemicals are significant because it removes the impurities which useful in the control of quality products (it removes the toxic chemicals). Role of activated carbon is effective in pharmaceutical extract in which different process



involve like vitamins, antibiotics, steroids, fermentation. Other important uses include dialysis of drug and poisons. It was used in the machine of dry cleaning, decaffeination, aquariums private & public, electroplating solution & cleaning. With the passage of time, many advances have been made to explore the beneficial effects of carbon³².

CONCLUSIONS

The activated carbons have been prepared by using different precursors. Research findings showed the uses of activated carbon in the medicine area. Higher surface area and good porosity development in the obtained activated carbon enhanced the adsorption capacity.

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