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Improvement the characteristic of Face Mask by Addition Arabic Gum or Activated Charcoal to Biopolymers

Abeer Adnan Abd

Engineering Materials collage ,Babylon university

abeeradnanabd@gmail.com

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Abstract

In this study, number of face masks were prepared with two different base materials ; polyvinyl alcohol(PVA) polymer and gelatin polymer masks as a base materials .Arabic gum and activated charcoal were used seperatly by (0.2 ,0.4 ,0.6 and,0.8) wt % to enhance the skincare and removing blackheads. The physical properties like spread ability, drying time, irritation test, homogeneity test and PH test evaluated .Results showed that The prepared samples have good spread ability (3-7) cm therefore the polyvinyl and gelatin based mask distribute evenly on the skin, and perfect drying time and with no redness and without inflammation and no swelling in the skin. The mask is suitable for all kinds of skin due to its natural components and odorless which whitening the skin and make it soft, clean and shine. Gelatin based mask suitable to remove black heads because it have good adhesion with the skin. polyvinyl based mask removed easily more than gelatin based mask due less adhesion to skin than gelatin mask.

Key words: Face mask, PVA, Gelatin, Arabic gum, Activated charcoal.

Introduction:

Face mask is used for beautifying produces that mainly helps to keep fast , strong moisturizing and skin repair. Several customers are observing for a enhancing product which is usual, healthful, effective, and it has fast and deep effect on the skin. [1,2,3]

Natural Polymers like gelatin are the most famous polymers used for skincare. polymers such as poly(vinyl alcohol) and silicone are among the main components used in the formulation of facial mask. [3, 5] Face mask formed as hydrogels because it can provide high water content, easy rinse and get high effect on the skin. [4,6]

Some ingredient should be added to enhance skincare like Arabic gum which is natural plant polymer and activated charcoal. Activated charcoal added to polymers masks to provide deep pore cleaning and skin debris removal. Sweta V.Kulkarni used activated charcoal to clean and remove wrinkles and whitening the skin [5-10]

Arabic gum (GA) is a branched, neutral or slightly acidic, composed from mixture which contain calcium, magnesium, and potassium salt. Arabic gum has effectiveness as an antimicrobial and antioxidant also tightening the skin to remove wrinkles and aging effect due to free radical . Ruei-Yi Tsai used Arabic gum and gelatin to improve the fabrication of chitosan Nano fibers [10-15]

The formulation of peel off masks, based on polyvinyl alcohol (PVA), present as a film giving benefits to the cosmetic designs like anti-aging effect, moisture, tightening action and more soft skin. After one application the skin becomes clean , smooth,and removing dead cells. [8,9,10] The gel mask is applied to the skin with certain time. The ingredients of the mask dissolved in distilled water of the layer film formed. It can be removed immediately without needing to rinse. [16-20]

Gelatin and Arabic gum can produce films is hydrophilic in nature therefore its less resistance against water and the face mask washed easily after peeling clean black cells or dead cells tightening, whitening, peeling, and shining the skin . Rahmawanty, D.,Yulianti. N. used gelatin and gelysrin to moisturize , peeling off, clean, remove black heads in the the skin [21,22]

The aim of the work:

The main goal of the work was to investigate the face mask properties to clean ,tightened, peal and moisture the skin by using natural components. The Arabic gum and activated charcoal enhanced the characteristics of the mask more than other ingredients showed in other research.

Expermental work:

Samples preparation:

In this study the samples prepared from PVA which is product in Iran . the molecular weight 85,000 to 124,000 (g/mol) , gelatin product in Iran. the molecular weight 45 g/mol .its prepared by dissolved Arabic gum in distilled water (|1) gram for each 100 ml then in other samples the filler content increase) then the PVA 10 g added. the mixture blended in stirrer at 70 oC until all the components dissolved in water and the blend became homogenous. two kinds of fillers with different ratios(4%,8%,12% and16%) of Arabic gum alone and activated charcoal alone at 70 oC using intensive mixer for one hour.

The samples of gelatin based material prepared by dissolved gelatin in distilled water at intensive mixer at 60oC with two kinds of fillers with different ratios(4%,8%,12% and16%) of Arabic gum or alone and activated charcoal alone for 15 mint. The other ingredients such as polyethylene glycol as surfactant ,methanol solvent and glycerin as smoothing agents added at (0.4 g,1ml,1ml) respectively. Table(1,2) represent samples content for gelatin base material and the same content repeated for PVA except that PVA content is 5(g).

Table (1) the components of the samples which contain gelatin as a base material

Sample number	Content				
	Gelatin(g)	Arabic Gum(g)	Glycerin	Polyethylene glycol(g)	Methanol
1.GA1	10	0.2	1 ml	0.4	1 ml
2.GA2	10	0.4	1 ml	0.4	1 ml
3.GA3	10	0.6	1 ml	0.4	1 ml
4.GA4	10	0.8	1 ml	0.4	1 ml

Table (2) the components of the samples which contain PVA as a base material

Sample number	Content				
	PVA(g)	Arabic Gum(g)	Glycerin	Polyethylene glycol(g)	Methanol
1.PA1	5	0.2	1 ml	0.4	1 ml
2.PA2	5	0.4	1 ml	0.4	1 ml
3.PA3	5	0.6	1 ml	0.4	1 ml
4.PA4	5	0.8	1 ml	0.4	1 ml

Tests used:

1. Organoleptic Test

Organoleptic tests are approved out to see the physical look of the measures by detecting the shape, color and smell. [14,15]

2. Homogeneity Test

Homogeneity testing is examined by put on rind off gel mask to a glass object or transparent material, then seeing the conformation or inhomogeneous units and record them. The preparation must show the same and homogenous order and should not show any coarse grains. [16,17].

3.Thickness Test

Film thickness was measured at different points . The thickness of the mask is homogenous and equal 0.2mm. [18,19]

4. pH Test

It was used to inspect the acidity level of the mixture. The test is directed by exhausting a pH meter that has formerly been used to pH solusion (4-7). After the pH meter electrode dipped in the samples gel then the result test was shown. The planning samples must encounter the skin criteria interval 4.5-6.5 [19,20]

5. Irritation Test

The irritation test is examined by put on an expressed peel off gel mask on the face or on the hands skin for 15 minutes to examine the irritation reaction such as swelling, itching and arising a redness effect on the skin. [21]

6. Spread ability Test

Its carried by applying 1 gram of gel mask located on a crystal or glass with size 20x20 cm and enclosed with another one. Then a mass is set on it until it range a weight of 100g and its diameter is measured after 1 minute. The test purposes to control the speed at which the gel spreads on the skin on its application. The dispersion desires are 5-7 cm (Rahmawanty, et al., 2015). [22]

7. Drying time Test

The time required to dry the gel mask of the preparation samples. Its examined out by smearing 0.1 gram of face mask on the back hand regularly over an area of 2.5 x 2.5 cm. The time necessary for the planning samples to dry was calculated by a stopwatch. The times were stately first from the rub on the face mask until a dry and elastic layer formed . [23]

Results and discussion :

1.Organoleptic Test :

its results when the mask used to specify the color in the samples formula were transparent because there was few content of Arabic gum in PVA sample one as shown in figure (1) . when the absorption of Arabic gum increase the samples color be more white due to the white color of Arabic gum .The color of gelatin samples is yellow .The transparent decrease when Arabic gum content increase as shown in figure (2).While the color of the gelatin samples in figure (3) is black because the activated charcoal content. The black color became more dark when the content of activated charcoal increase.[5]

2.The homogeneity test:

Its display that all samples did not have any coarse grains when applied to transparent glass. This result represented that the samples have a homogeneous structure.

The pH test : approved the acidity level of the samples simulates the criteria level of the skin. Strong acidic irritate the skin and strong alkaline dry the skin. The acidity level suitable to clean , moisturize the skin and prevent cracking.

The dry time test : of the samples the peel off gel mask didn't dry the skin after peeling off that's due to natural components of the mask..

Peel test: The peel gel was put on the skin hand surface evenly. The peel was permitted to dry. After 15 min the gel peeling off by hand . the skin after peeling became clean ,moisture , whitening , tightened , shine and soft .

3.The irritation test:

Its indicated that there is no redness and swelling and inflammation in the skin after remove the face mask. The PVA mask soften, smoothen, clean and remove the dead cells of the skin. The gelatin mask also soften , smoothen ,clean and remove the dead cells and black heads from the skin because it have good adhesive with a skin more than PVA face mask. The PVA mask and gelatin mask have good ability to wash but PVA mask is more easy to remove and peel off from the skin than gelatin mask.

The Arabic gum tighten the skin and have the ability to treat it and protect the skin clear without leather pills like ACNE desies because its act as antimicrobials and antioxidants.

The activated charcoal added to enhance the role of peel off mask by absorbing dust particles and opening the clogged pores because the sensitive skin is exposed to environmental pollution. Table (2) represent samples tests which contain PVA as a base material . The samples (PA) which contain PVA and Arabic gum with different percent ratio of Arabic gum. The samples (PC) which contain PVA and activated charcoal with different percent ratios. Table (3) represent the samples test which contain gelatin as a base material. The samples (GA) contain gelatin and Arabic gum with different percent ratio. The Samples GC contain gelatin and activated charcoal. Figures (5,6) represent the samples GA, GC respectively. Table (2) represent samples tests results.

4. Stability testing of the mask formulation:

Stability Testing was achieved at various temperatures of 10˚C,20˚C,30˚C,40˚C,50˚C,60˚C .The PVA samples stable at10oC, 20 oC, 30 oC and 40 oC then the viscosity increased of PVA samples because the temperature increased. The physical properties of the samples changed with temperature increased more than 40 oC. PH decreased from 6. 5 to 6.2 with temperature increased.

The gelatin samples effect by temperature change more than PVA because the viscosity increase with temperature decrease less than 30oC. When the temperature increase more than 40 ^{o}C the gelatin samples look like a liquid. When the temperature decreased less than 25oCthe gelatin samples became gel. Figures (4) and (5) represent the viscosity against shear rate for PVA and gelatin samples PA1 and GA1 respectively. The viscosity measured 33 CP for PVA sample and Gelatin sample. The degradation temperature of the Arabic gum and gelatin blend conclusion 59.69 ^{o}C from figure (5) for sample GA1 composed from gelatin and Arabic gum. The DSC test applied for one sample to get look about the degradation temperature of the gelatin that is due to that the gelatin less stable and effect with environment efforts therefore the mask should keep in refrigerator.

5.FTIR test for PVA based samples:

FTIR used to examine the effect of adding the additives to polymers . The PVA samples preferred in industry technology because its more toughness and less degradation than gelatin therefore FTIR test was used to PVA sample (PA1) as shown in figure (. FTIR indicated that there is esterification reactions between carboxylic groups of the Arabic gum and the hydroxyl groups of the PVA at 1705 cm-1 therefor the blend is homogenous. The intensity of absorption increased with Arabic gum content increased also there is physical interaction between molecules. When the Arabic gum content increase the skin tension increase to reduce the wrinkles in the skin .Also the increase in Arabic gum content repair the skin more and clean it because its antioxidant and antimicrobial effect. FTIR is important to indicate the molecular structure. PVA and arabic gum represent a copolymer hydrogel in the composition (20:80) (wt/wt) % as shown in Fig. (9). It is obvious that, gives a typical broad band at (3170.97-3387.9) cm-The C-O stretching vibration at 1141.86 cm-1 is a little strengthened due to the esterification reaction between the hydroxyl group in PVA and carboxylic groups in Arabic gum [24]. FTIR spectrum showed that the PVA- Arabic gum blend form copolymer hydrogel which more sharper and more intense than those of its components, GA and PVA. the reason behind that the crosslinking of PVA chains into Arabic gum, the macromolecular chains form a free network where in the grafted chains preferred pack up themselves to build a three-dimensional crystalline structure that shows well-defined sharp peak [24].

Band	Peak number Cm^{-1}
C-H stretching	2854.65
C=C	1705.07
C=O	1566.2
C-O vibration	1141.86
OH stretching	3170.97-3387.9

Figure (1) PVA and Arabic gum solutions

Figure (2) Gelatin and Arabic Gum solutions

Figure (3) PVA and Charechool solutions

Figure (4) Gelatin and charechool solutions

a. b.

c. d.

Figure (5) peel test a. sample PA1 b. sample PA2 c. sample PC1 d.PC2

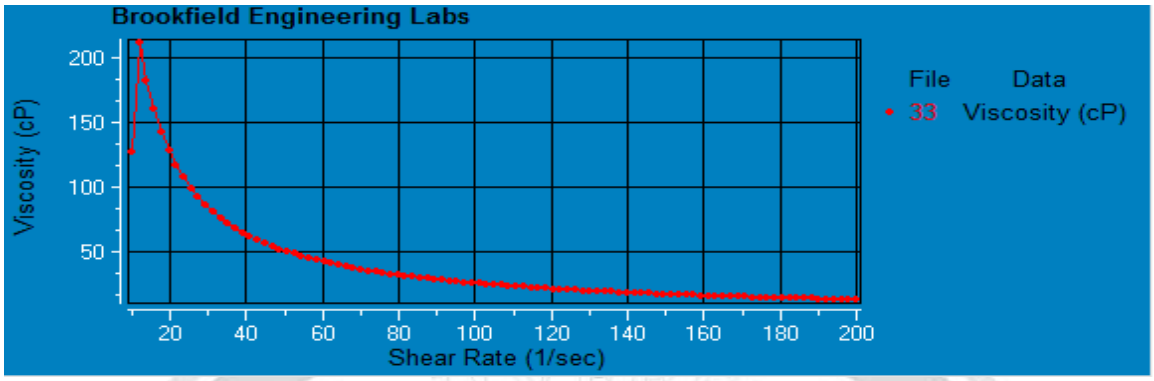
Table (2) samples tests results for PVA based samples

Sample number	Ph test	Spread ability Test(Cm)	Irritation test	Drying time test (min)
1.PA1	6.5	5.6	There is no redness and swelling	13
2.PA2	6.5	7	There is no redness and swelling	12
3.PA3	6.5	7	There is no redness and swelling	13
4.PA4	6.6	7	There is no redness and swelling	12

5.PC1	6	7	There is no redness and swelling	13
6.PC2	5.5	7	There is no redness and swelling	16
7.PC3	5	6.5	There is no redness and swelling	13
8.PC4	6	7	There is no redness and swelling	13.45

Table (3) samples tests results for gelatin based samples

Sample number	**Ph**	**Spread ability Test**	**Irritation test**	**Drying time test**
1.GA1	6	3.6 Cm	There is no redness and swelling	15 min
2.GA2	5.5	3.6 Cm	There is no redness and swelling	15 min
3.GA3	5.3	4.5 Cm	There is no redness and swelling	15 min
4.GA4	5.5	5.6 Cm	There is no redness and swelling	11 min
5.GC1	6	6.3Cm	There is no redness and swelling	15
6.GC2	5.7	5.9 Cm	There is no redness and swelling	14
7.GC3	5.5	4.5 Cm	There is no redness and swelling	13
8.GC4	5.8	4 Cm	There is no redness and swelling	15



Figure(6) represent viscusity versis shear rate for PVA sample PA_1

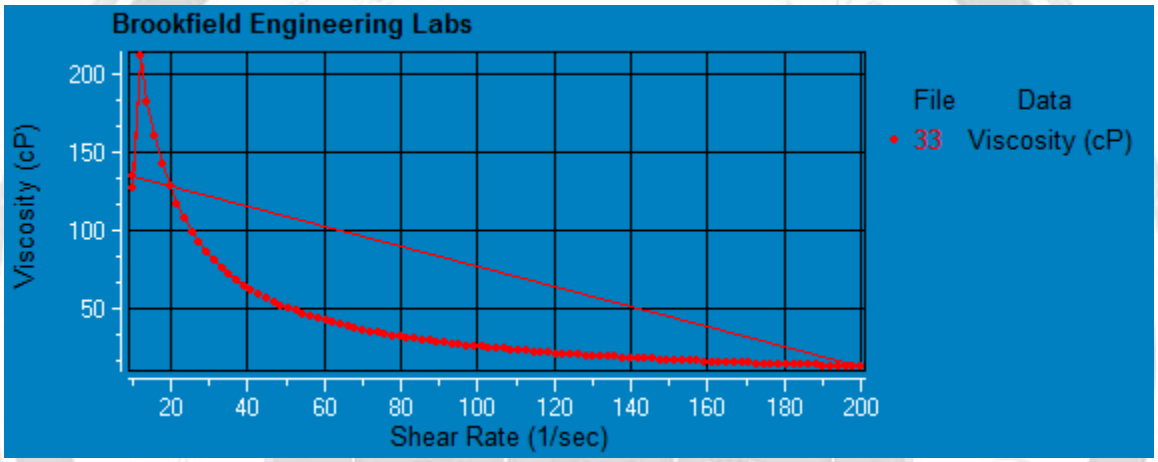


Figure (7) represent viscositty versus shear rate for gelatin sample GA_1

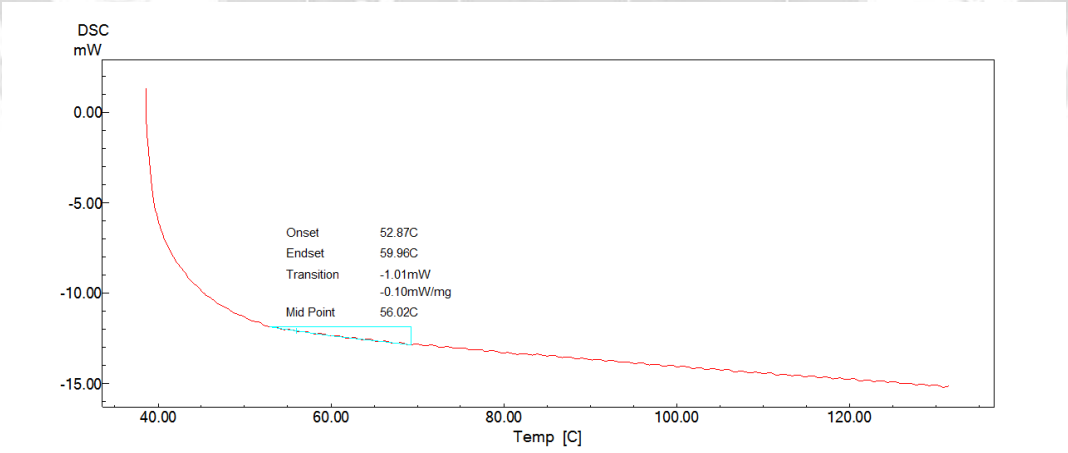


Figure (8) DSC curve sample GA_1

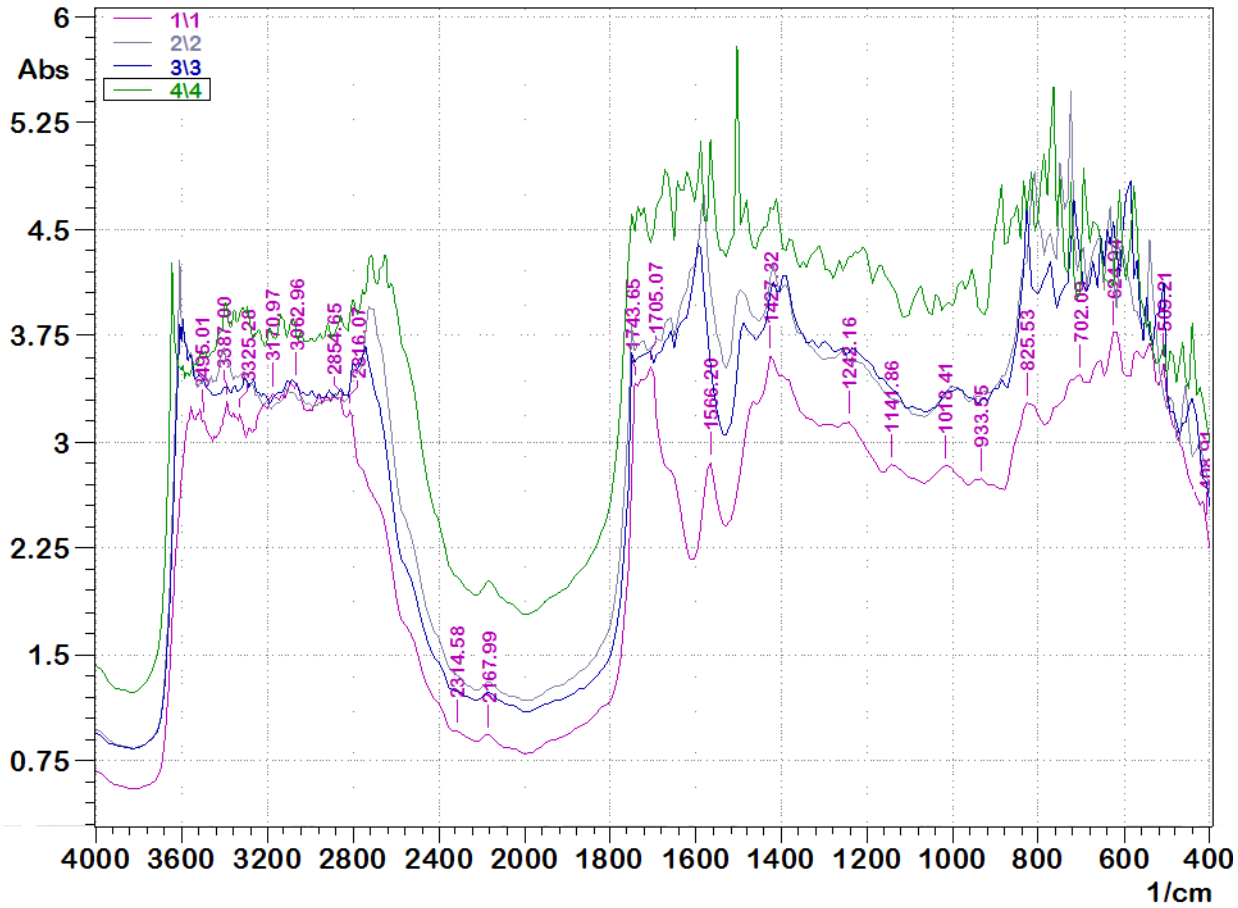


Figure (9) FTIR for PVA samples base materials s(solution 1,2,3,4 for arabic gum and PVA)

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تطوير مواصفات قناع الوجه بإضافة الصمغ العربي او الفحم المنشط للبوليمرات الحياتية

عبير عدنان عبد

جامعة بابل/كلية هندسة المواد

الخلاصة

في هذه الدراسة تم تحضير ماسكات للوجه من مواد اساس يوليمرية مختلفة من البولي فنيل الكحول وماسك الجيلاتين كمادة اساس. الصمغ العربي والفحم المنشط منفصلا يستخدم بنسب مختلفة (0.2,0.4,0.6و0.8) wt% لتحسين العناية بالبشرة وازالة الرؤوس السوداء. تم حساب الخواص الفيزيائية مثل قابلية الانتشار لذلك ماسك ذو اساس من البولي فنيل او الجيلاتين يتوزع بشكل متساوي و زمن التجفيف واختبار التهيج واختبار التجانس واختبار ال PH. النتائج بينت ان النماذج لها قابلية انتشار جيدة (3–7)Cm وزمن تجفيف ممتاز وبدون احمرار الجلد وبدون اي تهيج وبدون تورم الماسك ملائم لكل انواع البشرة الناتجة من مكونات طبيعية وبدون عطر والذي يبيض البشرة ويجعلها اكثر نظيفة وناعمة ومشرقة. ماسك الجيلاتين مناسب لازالة الرؤوس السوداء من الجلد. ماسك البولي فنيل يزال بسهولة اكثر من الجيلاتين لانه اقل التصاق بالجلد من ماسك الجيلاتين.

الكلمات الدالة: قناع الوجه، PVA، الجيلاتين، الصمغ العربي، الفحم المنشط.

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