

Investigation the performance of KO₂-fiberglass nanocomposite in O₂ supply and CO₂ removal in closed human respiratory environments

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Article history:

Received: 27/ Jan /2020

Received in revised form: 18/Feb/2020

Accepted: 23/Feb/2020

Abstract

Potassium superoxide-fiberglass nanocomposite is chemical oxygen source and carbon dioxide removal that can be used in human air revitalization systems. The potassium superoxide (KO₂) nanoparticles as a part of the nanocomposite were synthesized by the electrohydrodynamic (EHD) method and coated on the fiberglass support as the second part of the nanocomposite. To investigate the morphology of synthesized nanocomposite (KO₂-fiberglass), field emission scanning electron microscopy (FESEM) was employed. The results showed that the KO₂-fiberglass nanocomposite obtained by EHD has a uniform structure in the nanometer dimension. To simulate oxygen generation and carbon dioxide removal of the nanocomposite, a human-like lung simulated (HLLS) set-up was designed and made. Experimental studies in the HLLS set-up were performed under different humidity and the effect of humidity was investigated on the changes of oxygen and carbon dioxide concentration. Consequently, studying data showed that KO₂-fiberglass nanocomposite has suitable performance as air revitalization because increases oxygen amounts up to 29.4 percentage. Also, carbon dioxide amount is decreased to half, which is twice faster than of commercial KO₂ samples (in 60min). Moreover, the higher amount of humidity (85%) and temperature (45°C), as a catalyst, causes an increased rate of CO₂ removal and O₂ generation. Besides, the reaction rate constants were estimated by a kinetic model of nanocomposite of KO₂ and the activation energy of the process was calculated. The kinetic model of nanocomposite oxygen release proved that the reaction model is D4 and the amount of Ea is 12kJ.mol⁻¹.

Keywords: Respiratory air revitalization, Potassium superoxide/fiberglass nanocomposite, Oxygen generation, Carbon dioxide removal.

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1. Introduction

Air revitalization is based on chemicals such as superoxides, especially potassium and sodium superoxide [1–3]. They have chemical oxygen bound released by exposure to air moisture. Also, they are employed as oxidants and sources of oxygen. Typically, two methods were employed for supplying oxygen; (1) physical, and (2) chemical methods [4, 5]. The physical method uses compressed oxygen or air to generate oxygen [4], and the chemical one applies chemical oxygen compounds such as alkali metal chlorates/perchlorates and alkali metal peroxides/superoxides to generate oxygen [6]. Among these methods, the chemical ones provide high yield oxygen [7]. Each of the chemical oxygen sources has some advantages and disadvantages which is determined by reaction condition. For example, oxygen supply is provided by alkali metal chlorates/perchlorates rapidly, while they produce high amounts of heat immediately [8, 9]. In another example, alkali metal peroxides/superoxides generate oxygen by adsorption of carbon dioxide and other harmful gases; however, they are susceptible to environmental conditions, and controlling them is difficult [10]. The respiratory system (also respiratory apparatus, ventilatory system) is a biological system consisting of specific organs and structures used for gas exchange in animals and plants. In human exhaled air, the concentration of oxygen and carbon dioxide changes. The amount of oxygen varies between 21% - 19%, and carbon dioxide 5.6 - 3.6% (as shown in table 1 and 2 respectively) [11].

The oxygen supply methods commonly used in spaces with failure of O₂, contains high-pressure oxygen storage, liquid oxygen storage at low temperature, and chemical oxygen [12].

Table 1. effect of oxygen efficiency

Present oxygen in the air	Effect
17	Faster, deep breathing
15	Dizziness, buzzing in ears, rapid heartbeat
13	May loss consciousness
9	Fainting, unconsciousness
7	Life endangered
6	Convulsive movement, death

Table 2. effect of carbon dioxide concentration

CO ₂ concentration	time	effect
17-30	Within 1 min	Loss of controlled and purposeful activity, unconsciousness, convulsions, coma, death
10-15	1 min to several min	Dizziness, drowsiness, severe muscle twitching, unconsciousness
7-10	Few minutes	Unconsciousness, near unconsciousness
	1.5 minutes to 1 hour	Headache, increased heart rate, shortness of breath, dizziness, sweating, rapid breathing
6	1-2 min	Hearing and visual disturbances
	≥ 16 min	Headache, dyspnea
	Several hours	tremors
4-5	Within a few minutes	Headache, Dizziness, increased blood pressure, uncomfortable dyspnea
3	1 hour	Mild headache, sweating, dyspnea at rest
2	Several hours	Headache, dyspnea upon mild exertion

Several kinds of chemical oxygen sources include superoxides, oxygen candles, percarbonates, and liquid hydrogen peroxide [12]. Such oxygen source with characteristics of small volume, lightweight, easy to carry, simple to use, and high oxygen production, is needed for keeping ordnance, rescuing injured, using in spacecraft, submarines and etc. Therefore, chemical oxygen has been paid more attention from scientists [12]. Among all chemical oxygen sources, potassium superoxide, a heat and moisture-sensitive substance, is mostly used. The reaction between KO₂ and H₂O occurred at ambient, and higher temperatures cause hydroxide and hydrated hydroxide during reaction with the evolution of O₂ gases. It is used as a two-function material for air revitalization is made in two forms; tablet and plate [12, 13]. They have advantages like small size, large oxygen storage per unit volume, absorbing carbon dioxide while providing oxygen, without consuming power and etc., make them be applied as the main choice of the chemical oxygen sources [12]. Small tablet-like

potassium superoxide (STLP) is commonly used as a self-rescuer in poor places of O₂ [15]. Also, the larger plate-like potassium superoxide (PLPS) is used in submarines [16] and spacecraft [17]. One of the best choices of chemical oxygen sources is superoxide. Superoxide reacts with carbon dioxide and then oxygen is generated in the presence of water vapor. Consequently, granular and laminar potassium superoxide products have been developed. Recently, researchers attempted to combine potassium superoxide with a silicone polymer matrix or glass fiber matrix to improve the reaction stability [3, 17]. In this study, the air revitalization performance of synthesized KO₂-fiberglass nanocomposite as an air revitalization (AR) compound was synthesized by the electrohydrodynamic (EHD) method and investigated under static reaction conditions in a sealed reaction chamber. By analyzing the evolution of oxygen and carbon dioxide inside the chamber under experimental conditions (initial reaction temperature, humidity, and carbon dioxide concentration), the application of nanocomposite plate of AR was investigated and compared with other reported samples.

2. Experimental procedure

2.1 Materials and method

All chemical reagents were analytical grade and used as received without further purification. Deionized and doubly distilled water, Aqueous hydrogen peroxide solution 50% (V/V) and potassium hydroxide 90% (W/W), cobalt nitrate, and magnesium sulfate were all purchased from Merck (Tehran, Iran). Commercial fiberglass, as high-porosity polymeric support, was purchased from Qinhuangdao Dinuo technology Development carbon dioxide, oxygen, temperature, and humidity sensors were used to measure carbon dioxide and oxygen levels, temperature, and humidity during performance testing of samples. Table 3 provides a summary of the technical specifications of the used sensors.

2.2 Experimental set-up

The performance of respiratory air-revitalization compounds in a laboratory environment simulating human respiration is investigated using the required sensors. The KO₂-fiberglass nanocomposite was employed in a sealed chamber to investigate air revitalization performance.

Table 3. Technical specifications of sensors

Sensor type	Model	Range	Precision	Accuracy
Carbon dioxide	Testo 535 (Germany)	0 to 9999 ppm	1 ppm	± (3% + 75 ppm) from 0 to 5000 ppm ± (5% + 150 ppm) from 5000 to 9999 ppm
Oxygen (%)	Step System (Germany)	0 to 100%	0.1%	±0.4 mg/l of dissolved oxygen in the air
Humidity Ratio (%)	LUTRON YK-90HT (Taiwan)	10 % to 95 %	0.1 %	≥70% RH: ± (3% reading + 1% RH). < 70% RH: ± 3% RH
Temperature (°C)	LUTRON YK-90HT (Taiwan)	0 to 50 °C, 32 to 122 °f	0.1 Degree	°C -0.8 °C, °F - 1.5. °F

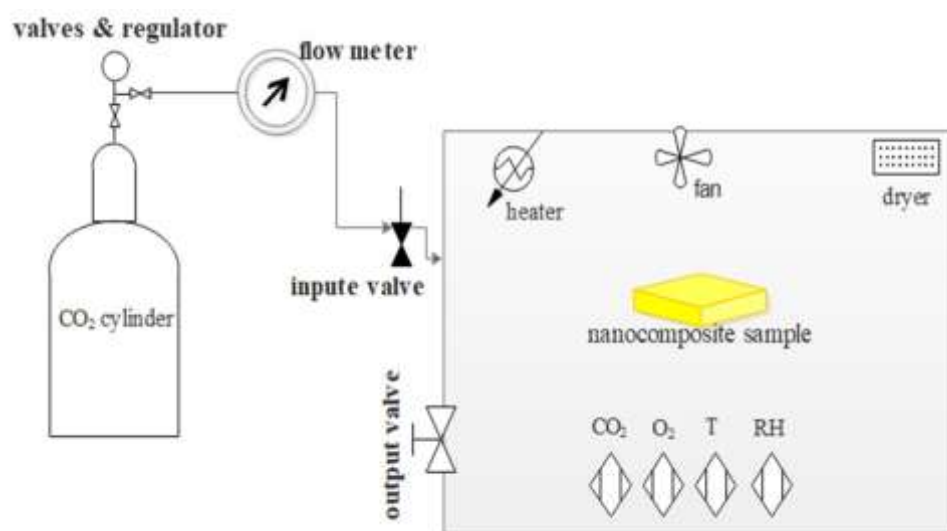


Fig. 1. Schematic illustration of the functional test device

To this purpose, a Plexiglass box with 60×60×60 cm in length, width, height was selected. The schematic of this set-up is shown in Fig 1. This device contains sensors of carbon dioxide, oxygen, temperature, and humidity measurement and also, heater and humidifier. Sealing polymers made of EPDM Rubber to seal the device and polyurethane adhesives to insulate the device.

Adjusting the temperature, humidity, and carbon dioxide level was performed by a carbon dioxide gas cylinder with 99.99% concentration, humidifier, and a 100 (w) lamp as a heater.

2.3 Experimental method:

The KO₂-fiberglass nanocomposite was synthesized in previous [19]. Typically, the solution of hydrogen peroxide was prepared at first. Then, a particular piece of polymeric support was impregnated in the H₂O₂ solution and was exposed to a high voltage electric field finally, which caused KO₂ to be synthesized on support. Then, the function of synthesized nanocomposite was investigated by simulated human respiratory set-up. To this purpose, a piece of nanocomposite sample in 5mm length, 5mm width, 2mm thickness, and 3g of weight containing 29.5% active oxygen content was used. This nanocomposite was put in the sealed and isolated chamber(device).

In this experiment, parameters such as temperature, humidity, and carbon dioxide concentration were

adjusted on 23, 29, 35, and 45 °C, and 17, 25, 5, and 85%, and 9,000 ppm, respectively. The reaction begins immediately after the nanocomposite is exposed to moisture. At the beginning of the test, changes in the experiment environment, the concentration of carbon dioxide, and oxygen were recorded at times of 5,10,15,20, 35, and 60 min.

2.4 Active oxygen content and carbon dioxide absorption rate measurement

To determine the active oxygen content of the KO₂-fiberglass nanocomposite at the beginning of the test, a piece of weighted synthesized KO₂-fiberglass nanocomposite was put in a beaker. Then, 10 ml of the aqueous solution of cobalt nitrate 5% (W/V) was added to the beaker contains nanocomposite. After minutes, oxygen bubbles were generated and the total weight of the sample was reduced. The active oxygen content was calculated by the equation (1):

$$\text{Oxygen (\%)} = \frac{w_i - w_f}{w_i} \cdot 100 \quad (1)$$

W_i is the initial and W_f is the final weight of the synthesized nanocomposite sample.

To calculate the CO₂ absorption rate of the nanocomposite, equation (2) was used:

$$\text{WCO}_2 = \frac{C_{i\text{CO}_2} - C_{f\text{CO}_2}}{\Delta t} \quad (2)$$

WCO₂ (mg/L.min) is the rate of carbon dioxide absorption by nanocomposite based on potassium

superoxide. C_{iCO_2} is the initial concentration of carbon dioxide at the start of the air recovery process, C_{fCO_2} is the final concentration of carbon dioxide at the end of the process, and Δt is the time of test (min) [20].

2.5 Method of calculating kinetic parameters

The degree conversion of reaction (α) parameter can be used to calculate the kinetic parameters. The value of α varies between 0 and 1 and measures the rate of reaction progress. On the other hand, the constant relationship between rate constant and temperature is expressed through the Arrhenius equation [21]. Where A is the pre-exponential (frequency) factor, E_a is the activation energy, T is the absolute temperature and R is the gas constant.

Table 4. Rate expressions for different reaction models [22]

Reaction model	Integral model
	$g(\alpha) = k t$
Nucleation models	P2 $\alpha^{1/2}$
	P3 $\alpha^{1/3}$
	P4 $\alpha^{1/4}$
	A2 $[-\ln(1-\alpha)]^{1/2}$
	A3 $[-\ln(1-\alpha)]^{1/3}$
	A4 $[-\ln(1-\alpha)]^{1/4}$
Geometrical contraction models	R2 $[1-(1-\alpha)^{1/2}]$
	R3 $[1-(1-\alpha)^{1/3}]$
Diffusion models	D1 α^2
	D2 $[(1-\alpha) \ln(1-\alpha)] + \alpha$
	D3 $[1-(1-\alpha)^{1/3}]^2$
	D4 $1-(2\alpha/3) - (1-\alpha)^{2/3}$
Reaction-order models	F0/R1 α
	F1 $-\ln(1-\alpha)$
	F2 $(1-\alpha)^{-1}-1$
	F3 $0.5[(1-\alpha)^{-2}-1]$
$k = A e^{\frac{-E_a}{RT}}$ (3)	

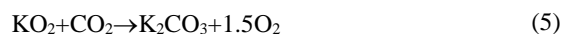
The integral model of the reaction is as follows. The different reaction models that are more used in this category of reactions are shown in Table 4 [23].

$$g(\alpha) = kt \quad (4)$$

3. Results and discussion

3.1 Reaction process of potassium superoxide

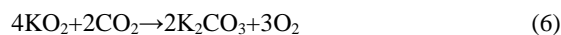
Potassium superoxide does not react with carbon dioxide in dry air because the heat of this reaction has been estimated to be 43.1 kcal [24].



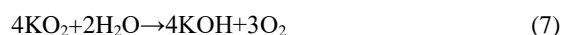
Therefore, achieve the high heat of the reaction, is almost impossible. In the reaction of KO_2 with moisture containing carbon dioxide at 10°C or less, the $K_2C_2O_6$ is formed and only the superoxide's oxygen is released. At 50°C or above, all active oxygen is released with the formation of potassium carbonate and bicarbonate [25]. The reaction of moisture-containing CO_2 with KO_2 can be caused to the formation of $KHCO_3$ at 60°C and below. Under these conditions, the ratio of absorbed CO_2 to released oxygen is more than 0.67 [26].

Under experimental conditions, the chemical reaction equations of nanocomposite plates are as follows (see Eqs (6)– (8)):

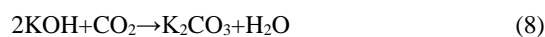
At first, the nanocomposite plates with bright yellow-color react with ambient CO_2 directly, then potash formed and oxygen released (Eq (4)).



In this section, adsorbing of ambient water vapor onto its surface, forming orange-colored plate hydrate, which subsequently reacts with further water vapor to form white potassium hydroxide and then oxygen release (Eq (5)).



Now, Potassium hydroxide continues to react with CO_2 to produce potash and water. here, water plays a role as a sort of autocatalyst in the oxygen generation of plates (Eq (6)). Therefore, the reaction of KO_2 with CO_2 and the generation of O_2 is affected by the amount of humidity.



3.2 CO_2 Conversion to Oxygen in the Presence of KO_2 -fiberglass Nanocomposite

As can be seen in Table 5(a-d) and Fig. 2(a, b), over time, with the intense absorption of CO_2 in the environment by the KO_2 -fiberglass nanocomposite, under different humidity, a sharp decrease in ambient CO_2 and an increase in the amount of O_2 occur. Even the data in Table

6(a-c) and Fig. 3(a,b) show that over time, the absorption of CO₂ and generation of O₂ increased by increasing temperature.

As shown in Fig. 2b and 3b, it obvious that there is a decrease in the concentration of existing CO₂ during the experiment from start to the endpoint, and the slope of the curve decreases by the time till the stabilization of the reaction ends. It is because of the KO₂-fiberglass nanocomposite reaction with existing CO₂, which lows the CO₂ concentration. While the reaction continued, the amount of KO₂ and the other products refuse the reaction to be continued and decreasing the reaction rate [27]. The synthesized KO₂ not only reacts with CO₂ but also hydrated. So, this subject causes the concentration of CO₂ decreased by adsorption of KOH.

Table 5 and Fig. 5(a, b) show the effect of moisture on the performance of the KO₂-fiberglass nanocomposite. It is obvious that with increasing humidity, the KO₂-fiberglass nanocomposite produces more O₂ and absorbs more CO₂ quickly. The reason for this phenomenon is that KO₂ is hygroscopic and reacts strongly with water and absorbs carbon dioxide so produces oxygen and potassium hydroxide at a higher rate. As Table 5 shows, the amount of produced oxygen increases from 1.1 to 1.5 times with increasing humidity at a constant time.

Table 5. Variation of carbon dioxide concentration and amount of oxygen in the KO₂-fiberglass nanocomposite medium over time with 9000ppm of initial CO₂ concentration and 19.2% of active O₂ under four different humidity conditions a)17%, b)25%, c)50% and d)85%

(a)			(b)		
T(min)	CO ₂ %	O ₂ %	T(min)	CO ₂ %	O ₂ %
5	8674	19.3	5	8143	19.3
10	7957	20	10	6920	20
15	7086	20	15	6266	20.4
20	6731	20.4	20	5963	21.6
35	6258	20.6	35	5293	22.3
60	5763	20.8	60	4884	22.7
(c)			(d)		

T(min)	CO ₂ %	O ₂ %	T(min)	CO ₂ %	O ₂ %
5	7851	20.4	5	7408	20.9
10	6548	21.6	10	6326	22
15	5832	22.8	15	5481	24.7
20	5127	24	20	4784	26.6
35	4641	25.7	35	4108	28.1
60	4002	26.5	60	3561	29.4

Table 6. Variation of carbon dioxide concentration and amount of oxygen in the KO₂-fiberglass nanocomposite medium over time with 9000ppm of initial CO₂ concentration and 19.2% of active O₂ under four different temperature conditions a)23, b)29, c)35, and d)45°C

(a)			(b)		
T(min)	CO ₂ %	O ₂ %	T(min)	CO ₂ %	O ₂ %
5	8318	19.3	5	7513	19.6
10	7879	19.7	10	6920	20.8
15	7521	19.8	15	6266	21.6
20	7312	20.2	20	5963	22.8
35	6794	20.7	35	5293	23.7
60	6001	20.9	60	4884	24.2
(c)			(d)		
T(min)	CO ₂ %	O ₂ %	T(min)	CO ₂ %	O ₂ %
5	8084	21.4	5	7724	23.6
10	7003	22.9	10	6586	25.6
15	6168	24.7	15	5721	26.4
20	5278	25.8	20	4894	27.3
35	4512	26.9	35	4352	28.4
60	4095	27.4	60	3002	28.7

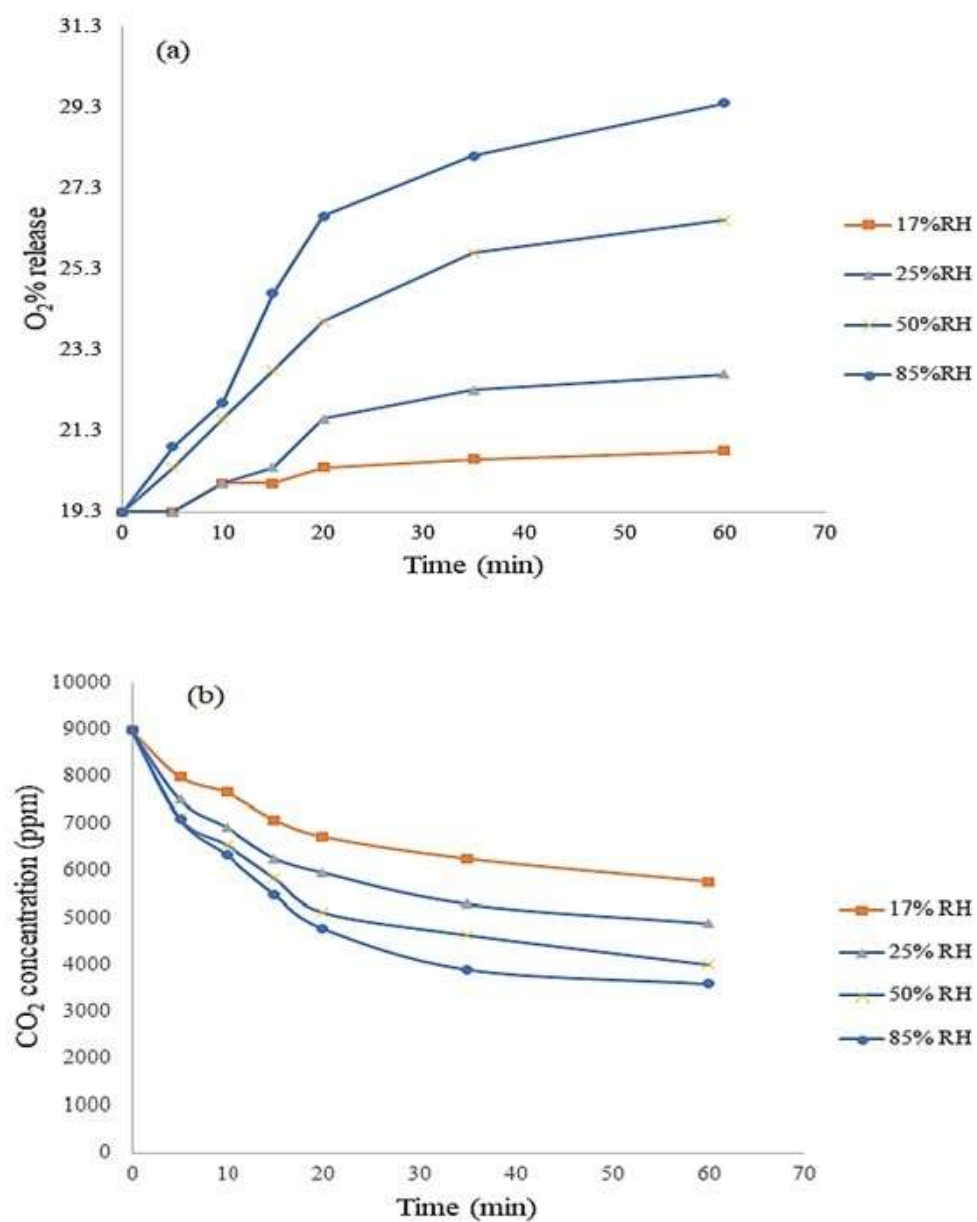


Fig. 2. The process of (a) oxygen generation and (b) absorption of carbon dioxide during 60 minutes for KO₂-fiberglass nanocomposite under different humidity

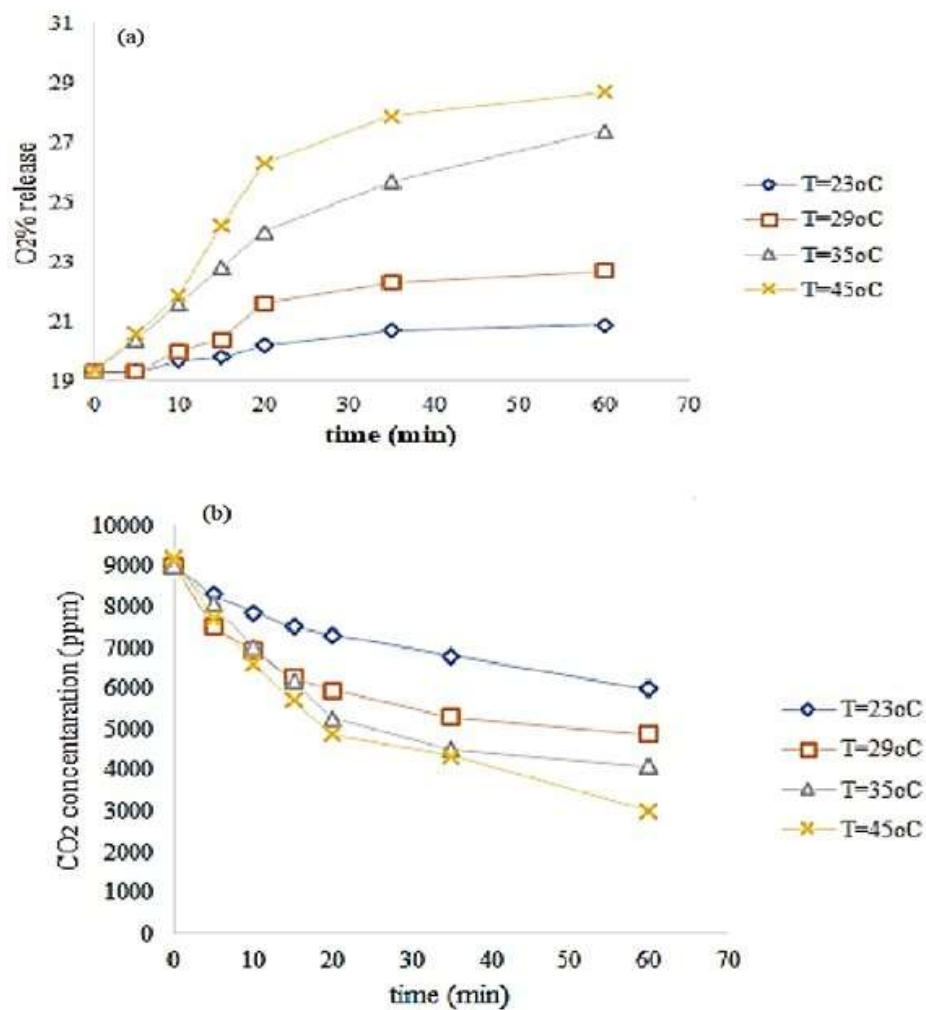


Fig. 3. The process of (a) oxygen generation and (b) absorption of carbon dioxide during 60 minutes for KO_2 -fiberglass nanocomposite at different temperature

Table 7. Basic conditions and experimental data of nanocomposite plates under different humidity and 29°C temperature

operating condition	humidity RH%	initial O_2 %	final O_2 %	initial CO_2 %	final CO_2 %	time (min)
1	17	19	20.8	9006	5763	60min
2	25	19	22.7	9006	4884	60min
3	50	19	26.5	9006	4002	60min
4	85	19	29.4	9006	3589	60min

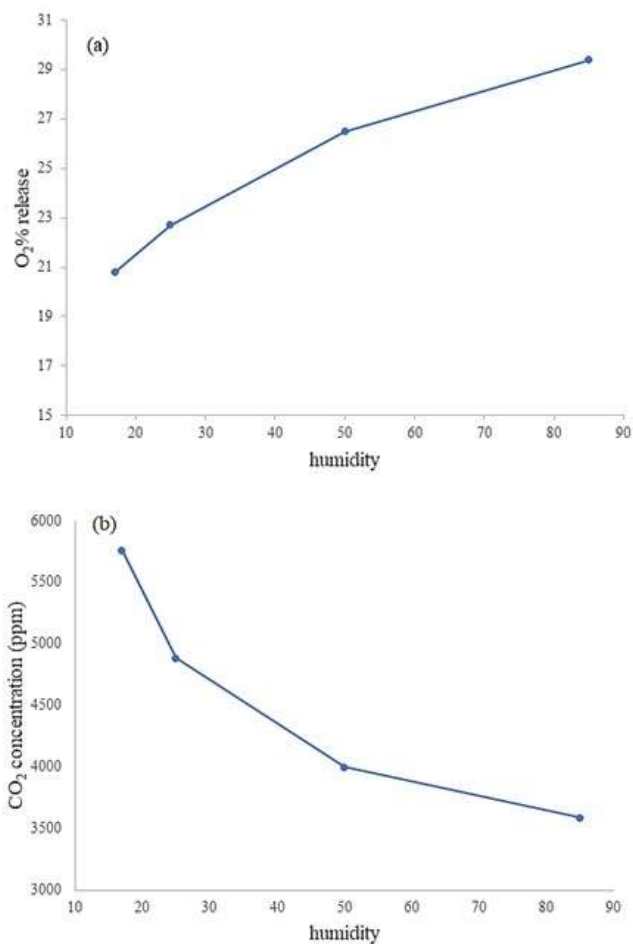


Fig. 4. The relationship between (a) active O₂% and (b) CO₂ concentration with humidity in functional test

Table 8. Basic conditions and experimental data of nanocomposite plates at different temperature and humidity of 25%

operating condition	temperature T (°C)	humidity RH%	initial O ₂ %	final O ₂ %	initial CO ₂ %	final CO ₂ %	time (min)
1	23	25	19	21	9006	6001	60min
2	29	25	19	23	9006	4884	60min
3	35	25	19	26	9006	4095	60min
4	45	25	19	29	9006	3002	60min

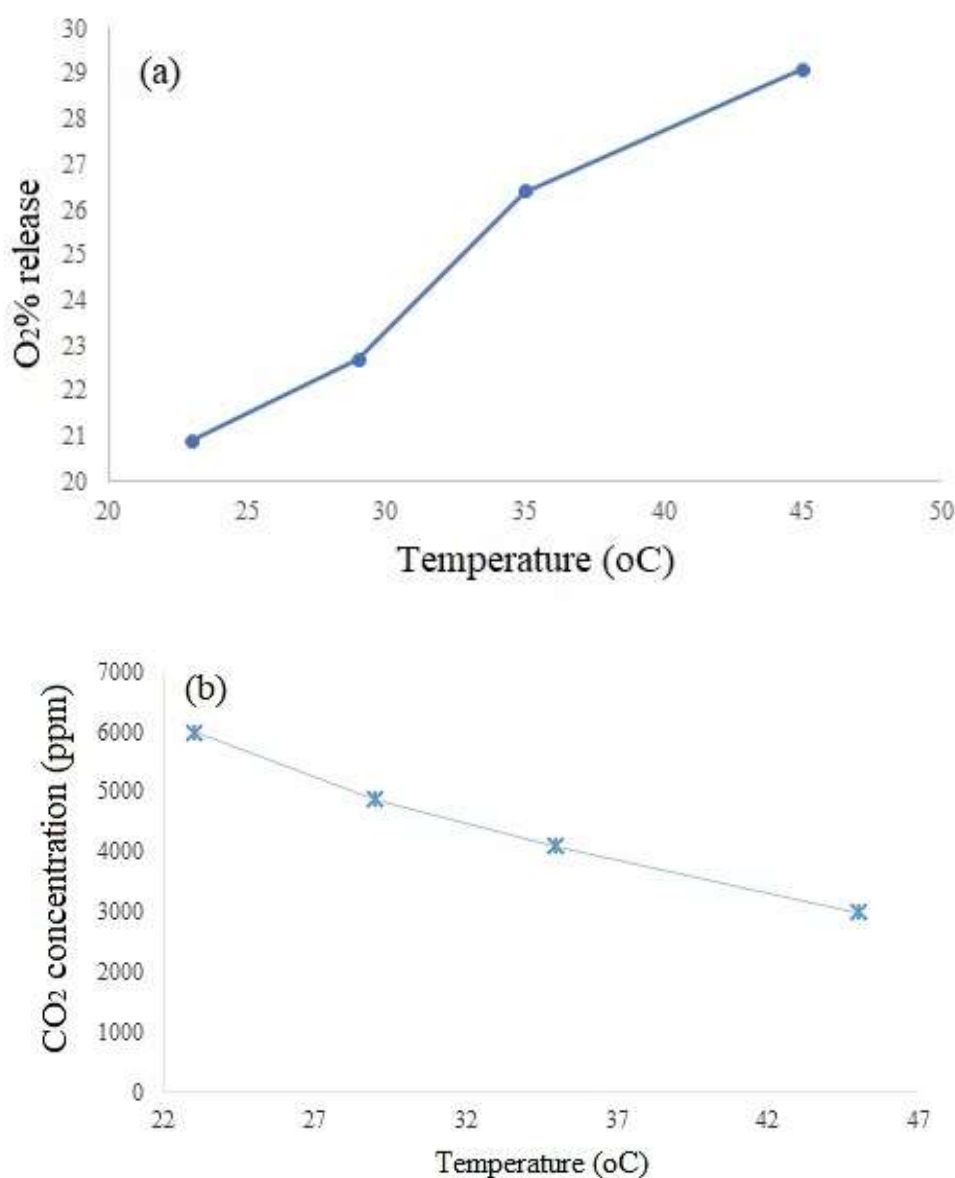


Fig. 5. The relationship between (a) active O₂% and (b) CO₂ concentration with temperature in functional test

Table 8 and Fig. 5(a, b) show the effect of temperature on the performance of the KO₂-fiberglass nanocomposite. It is obvious that with increasing temperature, the KO₂-fiberglass nanocomposite produces more O₂ and absorbs more CO₂ quickly. The reason for this phenomenon is that KO₂ is a heat-sensitive material and reacts strongly with water when the temperature increased and absorbs carbon dioxide so produces oxygen and potassium hydroxide at a higher rate.

3.3. Comparison of the function of KO₂-fiberglass nanocomposite and commercial sample

Fig. 6 shows the performance of KO₂-fiberglass nanocomposite in comparison with commercial products

of potassium superoxide, made of KO₂ powder mixed with performance-modifying additives that are widely used. As shown in Fig. 4, synthesized KO₂-fiberglass nanocomposite under the same condition (temperature and humidity), compared to commercial samples, absorbs and produces a higher amount of carbon dioxide and oxygen, respectively. The remarkable performance of the synthesized nanocomposite compared to the commercial samples is the absorption of carbon dioxide in less time and conversion of it to oxygen.

In other words, the conversion rate of carbon dioxide to oxygen with synthesized nanocomposite plate is twice as fast as with commercial samples. Moreover, the synthesized nanocomposite plate is performance-

modifying additives free, while commercial samples contain a significant percentage of additives that improve the absorption of moisture and CO₂.

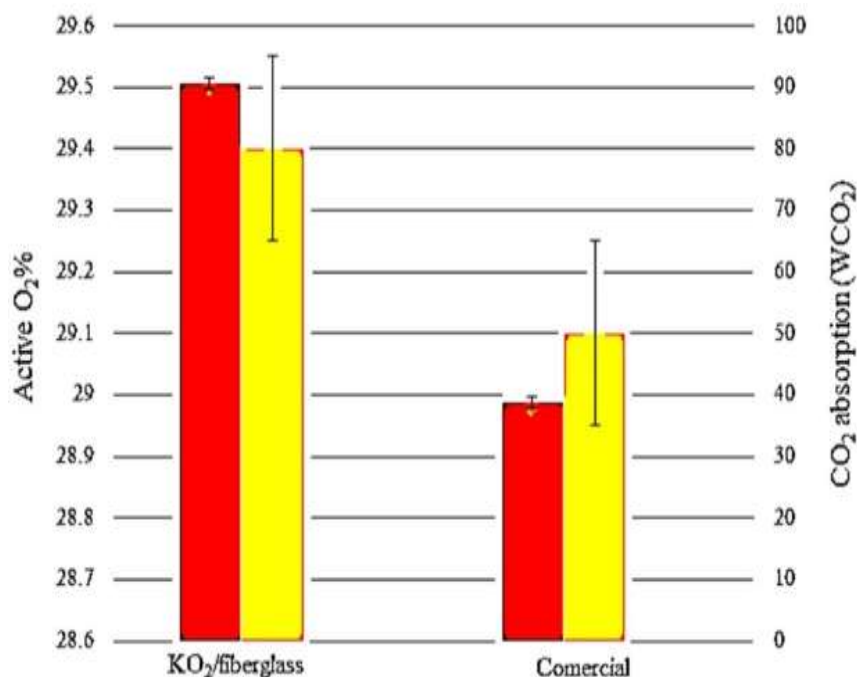


Fig. 6. Performance comparison chart of nanocomposite of KO₂-fiberglass with commercial samples

4.3. Kinetic of the reaction:

For each model in the Table 4 plotting $g(\alpha)$ versus t , a straight line can be obtained with the slope of k . The model which has the best fitting to the reaction and is describing the reaction has the highest and the lowest value for the correlation coefficient, and for the standard

deviation, respectively. The fitting data is shown in Table 9. According to the basic selection criterion, the most probable kinetic function has a correlation coefficient greater than 0.98 and a standard deviation less than 0.3, the most probable kinetic function is only the equation D4 as shown in Table 9.

Table 9. Kinetic mechanism function and fitting result

Model	Correlation coefficient (R)				Standard deviation (SD)			
	23°C	29°C	35°C	45°C	23°C	29°C	35°C	45°C
P2	0.8603	0.8499	0.7483	0.6519	0.4076	0.4168	0.3515	0.3497
P3	0.7981	0.7944	0.6758	0.5914	0.4209	0.4267	0.3505	0.3547
P4	0.7579	0.7571	0.6289	0.5573	0.4317	0.4355	0.3526	0.3586
A2	0.9801	0.9821	0.9620	0.9321	1.2874	1.2905	1.1959	1.1604
A3	0.9413	0.9411	0.8993	0.8547	0.8254	0.5302	0.7363	0.7217
A4	0.9057	0.9087	0.8455	0.7987	0.6759	0.5137	0.5839	0.5794
R2	0.9924	0.9847	0.9678	0.9354	0.3718	0.3776	0.3515	0.3353
R3	0.9818	0.9914	0.9853	0.9835	0.3588	0.3642	0.3403	0.3271
D1	0.9707	0.9588	0.9307	0.8929	0.4045	0.4117	0.3952	0.3678
D2	0.9349	0.9435	0.9862	0.9940	0.3882	0.2545	0.3832	0.3677
D3	0.9339	0.9398	0.9739	0.9906	0.3609	0.3665	0.3520	0.3466
D4	0.9969	0.9919	0.9914	0.9825	0.1259	0.1259	0.1239	0.1207
F0	0.9461	0.9243	0.8601	0.7796	0.3993	0.4125	0.3695	0.3493
F1	0.9036	0.9078	0.9252	0.9386	5.0485	5.0356	4.9084	4.8123
F2	0.8368	0.8368	0.8368	0.8368	377963.4000	377963.4444	377962.7000	377961.4000
F3	0.8368	0.8367	0.8368	0.8368	1.8898E+11	1.8898E+11	1.8898E+11	1.8898E+11

4.4. Calculation of the Kinetic parameters

According to the selected kinetic model D4, kinetic parameters are calculated in two steps; First, the curves of each temperature 23,29,35 and 45°C are being drawn and then the value of kT is obtained by slope of the curve. Thus, four values for k are obtained. Second, according to Arrhenius integral equation, the slope of the obtained straight line from $\ln k$ versus $1/T$ shows the E_a , and the y-intercept shows the $\ln A$. The data containing of E_a and $1/T$ of D4 model for releasing oxygen is shown in table 10. The value of E_a is equal to 12 as shown in table 9.

Table 10. The kinetic parameters (E_a , K) of nanocomposite

Kinetic parameters	45°C	35°C	29°C	23°C
K	0.0046	0.0052	0.0057	0.0065
E_a (kJ/mol)	12			
R^2	0.9928			

5.3. characterization

The fiberglass matrix, as a moisture absorbent, can improve moisture absorption and increase the reaction rate, consequently. Also, since the plate structures have a higher surface to volume ratio (compared to tablet samples), due to the availability of more KO_2 , the reaction rate is increased and the process of absorbing moisture and carbon dioxide, followed by the

generation of oxygen at a faster rate. On the other hand, the synthesized nanocomposites under the EHD medium have uniform nanoparticles distributed on the fiberglass matrix (Fig. 7). Particles in the nanometer dimension have a higher reaction rate than larger particles, a fact that is seen in this reaction (the reaction rate of plates coated with superoxide nanoparticles is twice that of commercial samples).

Changing the particle size to nanometer dimensions, due to increasing the surface-to-volume ratio in the compounds, leads to an increase in the amount of effective substance available and speeds up the adsorption and conversion reactions. The presence of such a regular and uniform structure in this composition, leads to an increase in surface area, as the most available surface, causes the reaction to occur much faster, and then the reaction rate increases dramatically.

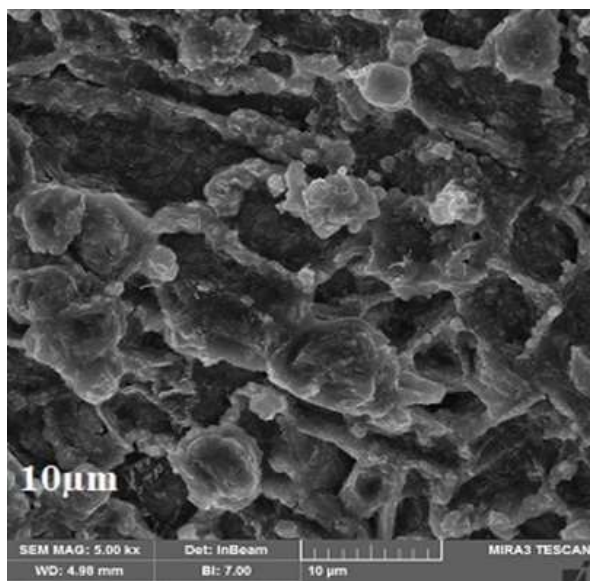


Fig. 7. FESEM image of KO_2 -fiberglass nanocomposite synthesized by EHD method

4. Conclusion

In this study, potassium superoxide-fiberglass nanocomposite was synthesized by electrohydrodynamic (EHD) as an eco-technique. The results showed that the nanocomposite can be employed as an air revitalization component because increases and decreases O_2 and CO_2 amounts up to 29.4(%) and to half in 60min (twice faster than of commercial KO_2 samples), respectively. Besides, the increasing rate of CO_2 abortion and O_2 generation was performed by a higher amount of humidity (85%) and temperature (45°C). With the air humidity increased (17% to 85%) the CO_2 absorption rate of nanocomposite increase about 1.5 times and O_2 generation increase about 1.3 times. Synthesis of potassium superoxide/fiberglass nanocomposite in EHD medium results in the formation of potassium superoxide nanoparticles uniformly on the fiberglass substrate and functionality of nanocomposite was improved by fiberglass support, because of its porosity which increased the adsorption ability of the final product. . Based on the results of statistical analysis on the modeling of reaction for oxygen releasing were shown that the best model for reaction is diffusion with equation of D4.

Acknowledgments

We are grateful to the Malek Ashtar University of Technology for its financial support.

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