

The active fire protection prototype for household scale kitchen based on silica gel from rice husk ash

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Back ground



silica

- € widely available in nature
- € a lot of research on the use of silica
- € a lot of research on making silica from materials containing silica elements

research purposes



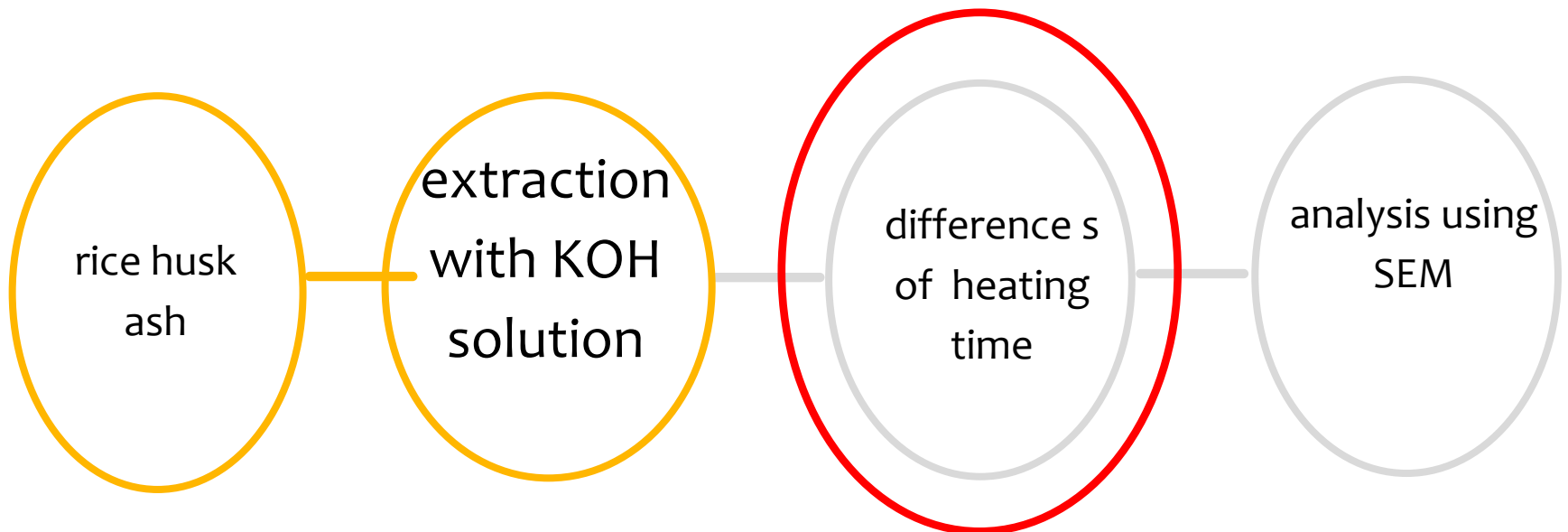
characteristics of silica from rice husk ash

utilization of rice husk ash

fire extinguisher

thermal silica properties

Characterisation of silica



Experimental set-up



(a)

(b)

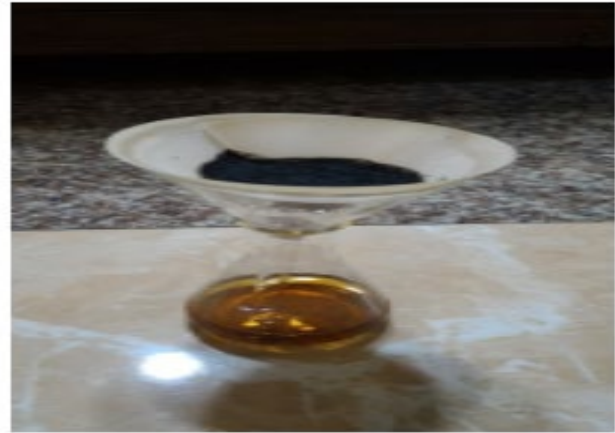
(c)

- added 0.5 M KOH and heated at 850C
- the time used is varied between 15 minutes, 30 minutes, 45 minutes and 1 hour
- The mixture of ash and KOH that has been heated, filtered using whatman 41 paper

Experimental set-up



(a)



(b)

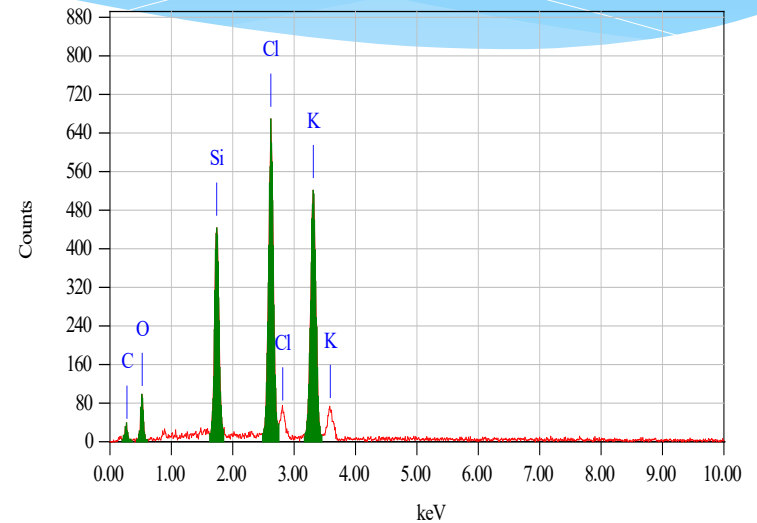
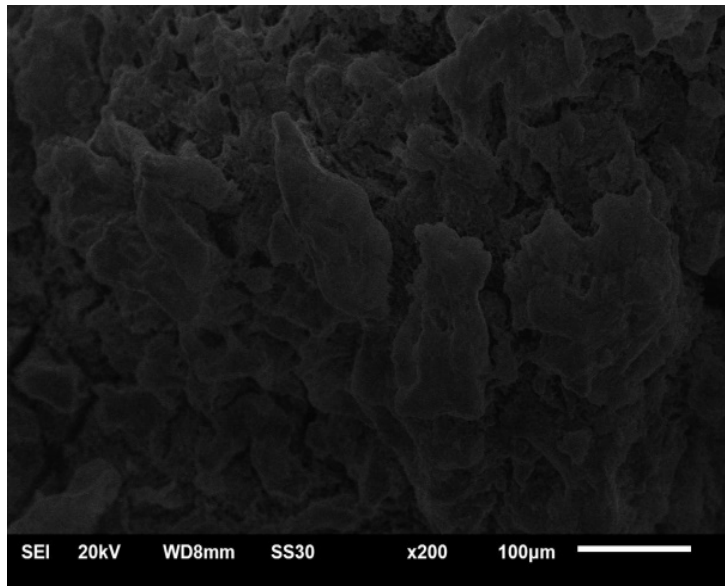


(c)



(d)

SEM results with 60 minutes heating

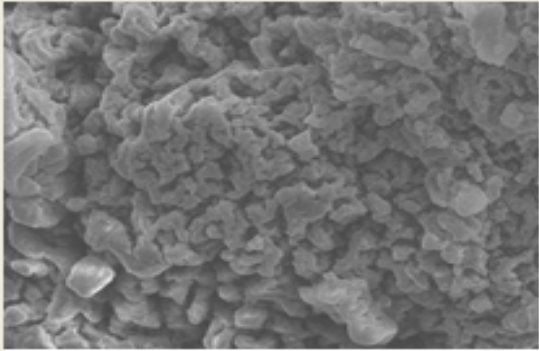
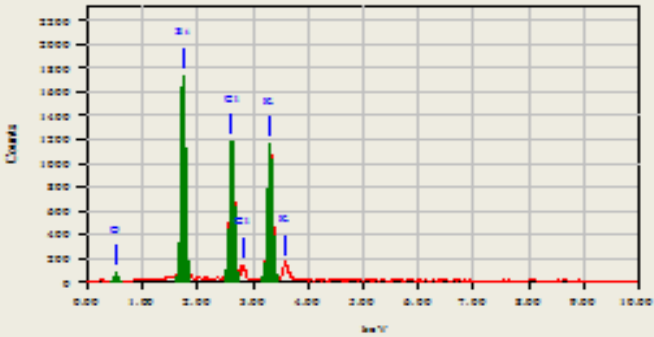
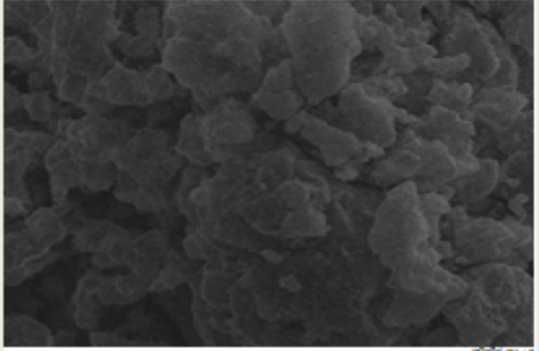
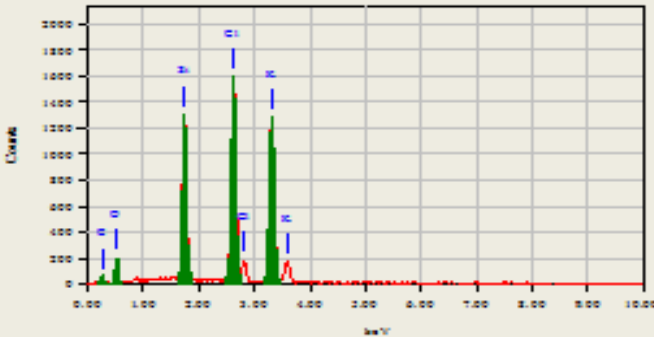
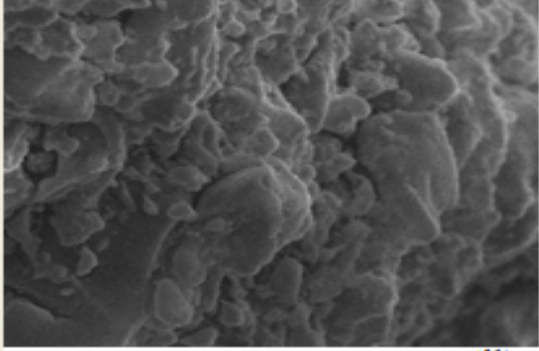
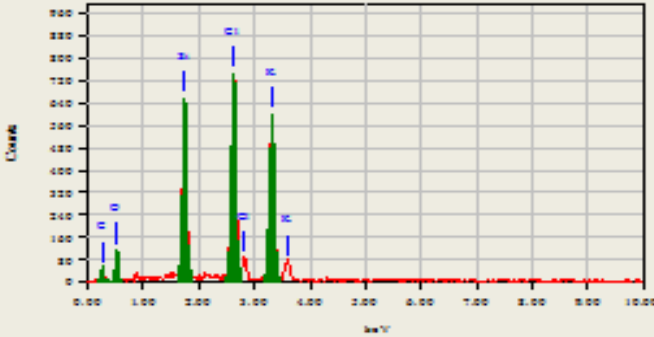
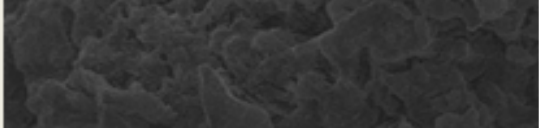
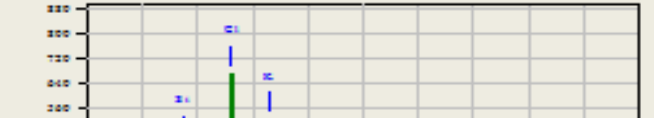


SEM results with 60 minutes heating

ZAF Method Standardless Quantitative Analysis
Fitting Coefficient : 0.3274

Element	(keV)	Mass%	Error%	Atom%	Compound	Cation	K
C K	0.277	24.04	1.42	38.66			4.1282
O K	0.525	29.42	0.99	35.52			19.5503
Si K	1.739	9.81	0.13	6.75			14.3460
Cl K	2.621	17.99	0.13	9.80			31.8516
K K	3.312	18.75	0.18	9.26			30.1239
total		100.0		100.00			

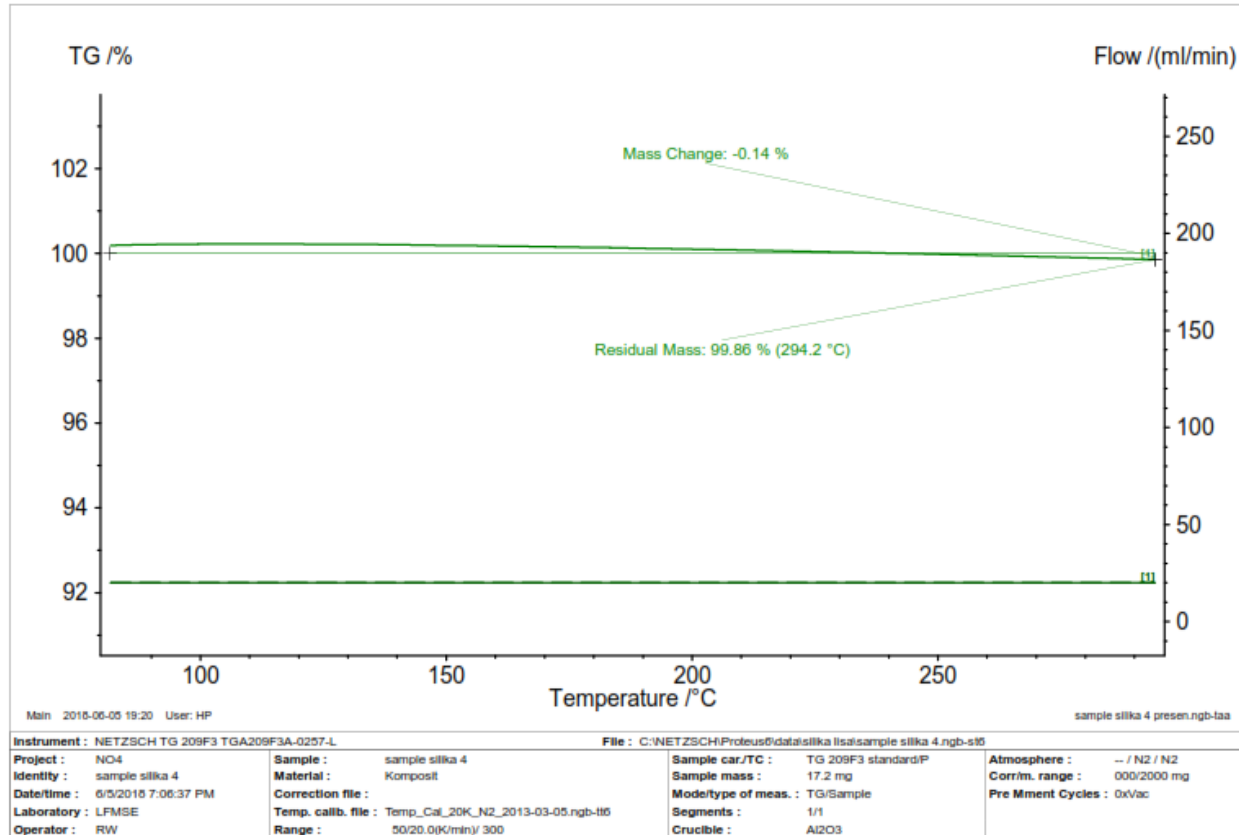
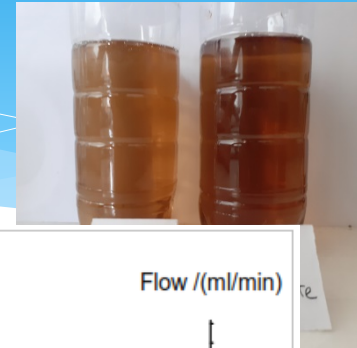
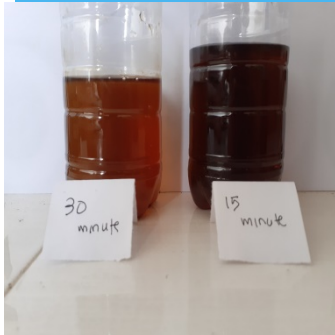
Comparison of levels of silica VS heating time

No	Heating Time	SEM photo result, zoomed to 200 μ m	EDS Result
1	15 minutes		
2	30 minutes		
3	45 minutes		
4	60 minutes		

Comparison of levels of silica VS heating time

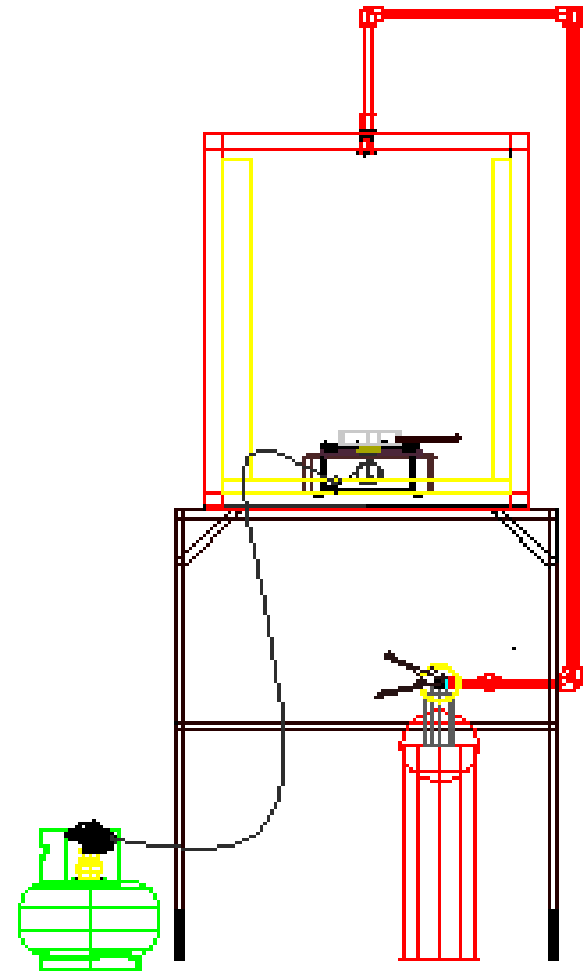
No .	Heating Time	Acquisition Parameter Instrument	Si	C	Cl	K	O
1	15 minutes	6510(LA) Acc. Voltage : 20.0 kV	24.73	18.69	22.82	28.54	17.91
2	30 minutes	Probe Current: 1.00000 nA PHA mode : T3	11.58	20.58	19.39	20.41	28.05
3	45 minutes	Real Time : 18.48 sec Live Time : 15.00 sec	10.39	29.50	15.86	16.11	28.14
4	60 minutes	Dead Time : 18 % Counting Rate: 3315 cps Energy Range : 0 - 20 keV	9.81	24.04	17.99	18.75	29.42

TGA Test



Prototype household scale in the kitchen

- a. Compartments, in the form of a box with walls made of 5mm thick GRC, box dimensions 60cm x 60cm x 110 cm
- b. 0.5 inch pipe
- c. Sprinklers mounted on the ceiling box
- d. Stove, gas, deep fryer and vegetable oil
- e. Fire extinguisher with silica gel from rice husk ash

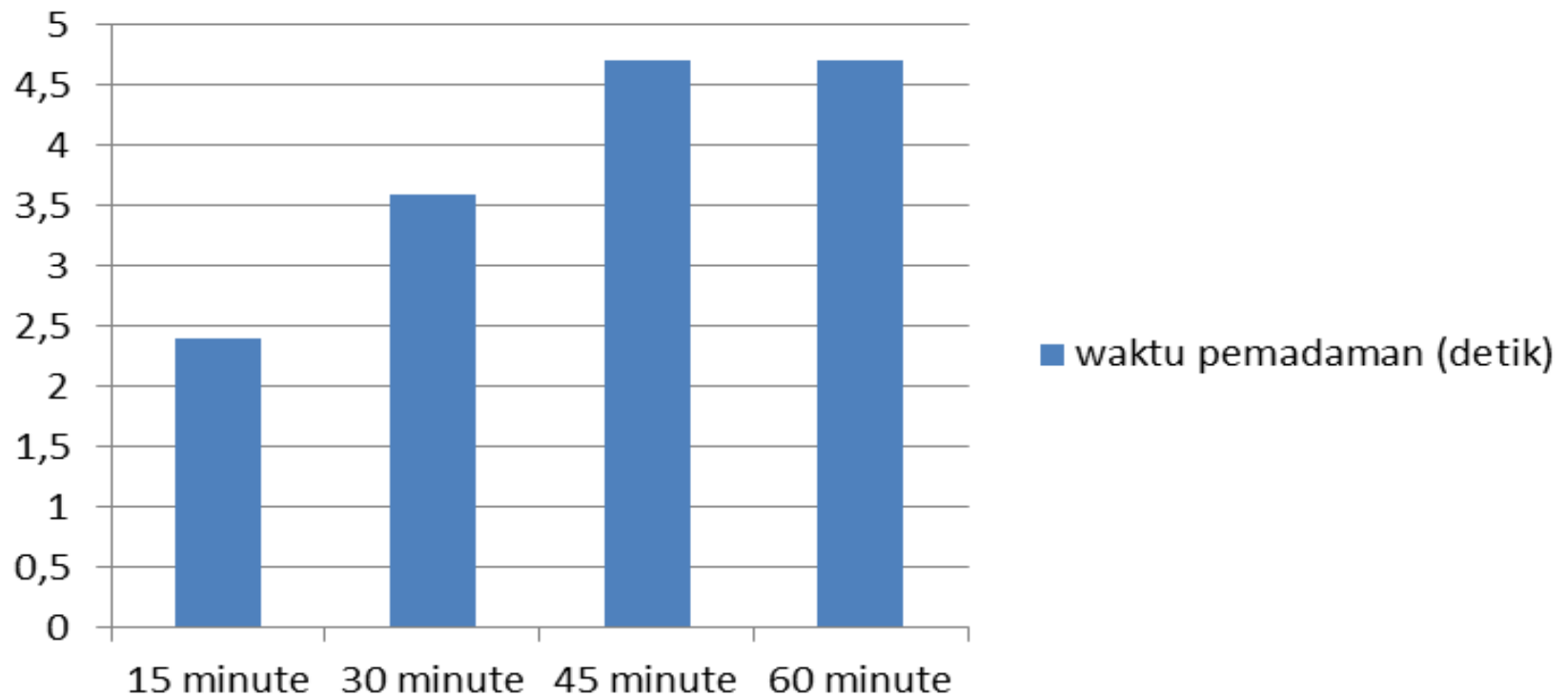


Burning kitchen utensils



Burn out time comparison

time of extinguishing (seconds)



conclusion

silica gel media from rice husk ash based on the results of the experiment in the form of 4 variations can be used perfectly. In this case evidenced by the extinguishing of the fire after a fire and breaking the sprinkler so the fire extinguisher works. The fastest time during the extinguishing process of extracted silica gel with a heating time of 15 minutes, where by giving silica gel the extinguishing time only takes 3 seconds after the sprinkler breaks

Thank you