Possibilities for Obtaining Activated Carbon Agent by Pyrolysis of Residual Materials Produced in Farms, Veterinary Clinics and Butcheries

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Usually the bovine breeding and butcheries produce biomaterials that are infested or may be easily infected are neutralized at the present by burning in ground. These paper present a new possibility for recycling of this materials by pyrolysis at 400- 500°C. By this method a solid carbonic residue having 3- 20% ash, crackable fluids and gases are obtained. The absorption capacity of the solid carbonic residues was studied and the values were estimated for iodine, methyl blue and toluene. The results justify usage of carbonic residue as an active carbon agent for water purification. The fluids from pyrolysis were cracked and transformed in combustible gases. These gases and those resulted from pyrolysis can partly provide the necessary energy of the pyrolysis process.

Keywords: pyrolysis, veterinary wastes

The paper presents possibilities to take advantage of waste coming from butcheries, clinics and so on, by pyrolysis at 400- 500°C, because the process generates a solid residue with absorption capacity for metallic ions can be used like activated carbon agent .

Porous tubes containing solid residue, as filling material, can be used as survey instrument for water pollution through the time . Periodical verifications give information about water quality. The residue is useful not only to monitoring but also for treatment of waste water from different sources.

Experimental part

Bones, organs, beef, degraded forages, were pyrolysed in laboratory conditions at 400°C having 3°C/min speed heating. From this process solid, liquid and gaseous substances results . All the materials were maintained for 30 min. at the end point. Solid residue ratio at pyrolysis is presented in table 1.

The analyses of this table show that waste mass decrease after pyrolysis, and solid residue can be used for monitoring waters and their treatment.

Solid residue composition resultant from pyrolysis, determined according to ISO standards, are presented in table 2.

Table 1

SOLID RESIDUES RATIO AFTER PYROLYSIS AT 400 °C

Generating organs	Meat	Internal organs	Bones	Degraded forages
Pyrolysis efficiency (%)	15,2	16,3	23,6	21,1

Table 2

SOLID RESIDUE COMPOSITION RESULTANT FROM PYROLYSIS AT 400 °C

Generating organs	Technical Analysis			
	Humidity	Ash	Volatile maters	Carbon fixed
	W^a (%)	A^a (%)	V^a (%)	C_f^a (%)
Meat	2,12	11,75	16,22	69,93
Internal organs	1,88	12,54	17,22	68,36
Bones	2,01	37,02	9,54	51,43
Degraded forages	2,34	7,45	15,14	75,07

Table 3

ELEMENTS CONTENT IN THE SOLID RESIDUE

Generating organs	Elements (ppm)									
	Na	K	Ca	Mg	Fe	Mn	Zn	Co	B	Cu
Meat	4200	21000	650	1500	240	8	7	6	25	2
Internal organs	6600	18000	600	25	650	10	9	6	30	4
Bones	150	180	$13{,}3 \cdot 10^3$	6300	930	35	27	12	98	12
Degraded forages	10200	9500	830	990	120	7	3	5	65	1

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Table 4
HEAVY METALS CONTENT VARIATION RESIDUES

	Heavy metals (ppm) Time (day)											
	1			5			10			15		
	Pb	Hg	Cd	Pb	Hg	Cd	Pb	Hg	Cd	Pb	Hg	Cd
Meat	8	9	7	15	17	13	17	18	14	18	18	14
Internal organs	5	6	8	12	15	16	14	17	17	15	18	18
Bones	5	4	6	14	9	11	15	11	12	16	12	13
Degraded foragrs	3	3	4	7	8	6	8	9	7	7	9	10

Table 5
HEAVY METALS CONTENT VARIATION THROUGH THE TIME IN SOLID RESIDUE SAMPLES INTRODUCED IN CONTAMINATED WATERS, IF THE CONTAMINATION INCREASES

Generating organs	Heavy metals (ppm) Time (days)								
	5			10			20		
	Pb	Hg	Cd	Pb	Hg	Cd	Pb	Hg	Cd
Meat	15	17	13	30	33	24	36	35	26
Internal organs	12	15	16	25	28	31	31	30	33
Bones	14	9	11	28	20	23	32	23	25
Degraded forages	7	8	6	20	16	12	29	30	21

Ions content in pyrolysed samples were determined by emission spectroscopy for trace elements, and by analytical methods for ion concentration higher than 1000 ppm. In table 3 metallic ions concentrations in solid residue resultant from sample pyrolysis are presented.

It is observed that pyrolysis residues do not contain heavy metals, so they can be used for water treatment which contain lead, cadmium and mercury. .

Each sample residue was introduced in porous cardboard tubs closed at extremities. Each 10 L of Pb^{+2}, Hg^{+2}, Cd^{+2} solution was prepared and 10 tubes was introduced in each solution. After 1, 5, 10 and respectively 20 days two tubes from each solution were take out and then analysed.

The results are presented in table 4.

The data show that all the residues trap heavy metals, so that they can be used as sensitive element. After 5 days absorption speed decreases significantly.

In order to know if a new contamination occurs, a new series of 10 L solution each containing two sensitive elements was prepared and after 5 days the solutions and sensitive elements (tubes) were half shared. A part was allocated to continue planned experiment and the second was each enriched with 0.02 g/L ions of Pb^{+2}, Hg^{+2} and respectively Cd^{+2} .

The analysis of first category sensors showed the results presented in table 4, and those of the second category sensors had values presented in table 5

A comparison between table 4 and 5 shows that sensors from enriched solutions with metals ions detected increase of concentration. Using great quantities of solid residues from pyrolysis as absorber /blocks, the sensors can be used for water treatment.

Conclusions

Animal and vegetal waste destruction by pyrolysis decreased the bulk to 15- 20% relative to initial material.

The temperature of 400 °C for pyrolysis residue is high enough to obtain an absorbent and sterile material.

Heavy ions, lead, mercury, cadmium, are not present in pyrolysis residue of such biomass.

Solid residue obtained can be used for monitoring quality waters regarding metallic ions pollutions.

The ions presence in pyrolysed materials is not a problem regarding toxicity because the same quantities are both in foods and other products.

Solid residue obtained can be useful for water treatment coming from farms.

Solid residue can be used for medical aim, having a similar structure and composition with "carbomedicinalis animals" medicine.

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