THE THERMAL DECOMPOSITION OF $CH_3{}^{131}I$ IN A GAS FLOW

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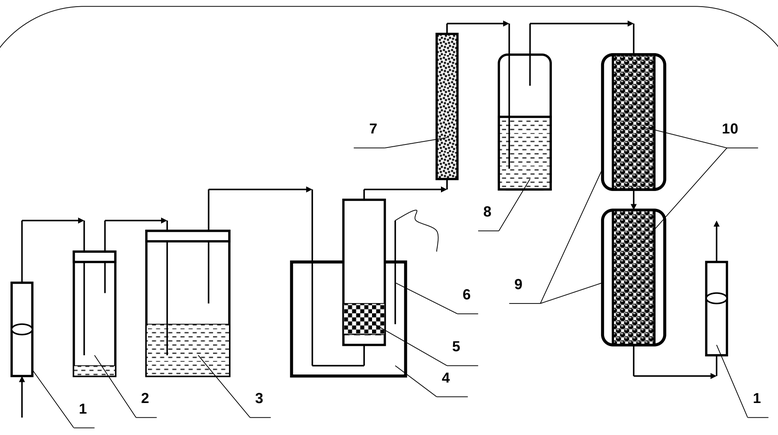
The study found that in the absence of "Fizkhmin"™ material, the degree of the decomposition of $CH_3{}^{131}I$ (10 mg) in air (flow rate 4.5–5.5 cm/s and time of the air flow presence in the heating zone 1.0 – 1.5 s) was equal to ~(7-10)% at (540 ± 10)°C, ~(70-75)% at (640 ± 10)°C, and ~(97-99)% at (770 ± 15)°C.

In the presence of silica gel granules measuring 1.0-3.0 mm, the degree of the decomposition of $CH_3{}^{131}I$ (10 mg) in air (linear flow rate 4.8–5.2 cm/s and time of the air flow presence in the heating zone 1.0–1.1 s) was equal to ~(2-3)% at (240 ± 10)°C, ~(10-15)% at (340 ± 10)°C, ~(75-80)% at (440 ± 10)°C, and ~(97-99)% at ~(540 ± 10)°C. Silica gel granules allow decreasing the $CH_{3131}I$ thermal decomposition temperature in an air flow by ~200°C.

In the presence of "Fizkhmin"™ granulated materials impregnated with Ni compounds or Ni-Cu mixture (8-10 wt.% and granule size 1.0–3.0 mm), the degree of the decomposition of $CH_3{}^{131}I$ (10 mg) in air (linear flow rate 4.8–5.2 cm/s and time of the air flow presence in the heating zone 0.8–1.1 s) was equal to <0.2% at (20 ± 3)°C, ~(0.3-1.0)% at (150 ± 20)°C, ~(15-30)% at (250 ± 10)°C, ~(85-92)% at (340 ± 15)°C, and ~(95-99)% at (465 ± 20)°C. "Fizkhmin"™ granules containing 8-10 wt.% Ni or its mixture with Cu, allow decreasing the $CH_3{}^{131}I$ thermal decomposition temperature in an air flow by more than ~300°C.

The work studies the dependence of the $CH_3{}^{131}I$ thermal decomposition degree on the concentration of a d-element in the "Fizkhmin"™ material and its storage time, as well as on the amount of $CH_3{}^{131}I$ in an air flow.



Scheme of test facility for study of the thermal decomposition of $CH_3{}^{131}I$ in gas flow

(1 - rotameters; 2 - a $CH_3{}^{131}I$ generator; 3 - scrubber with water; 4 - the heating furnace of mine type; 5 - composite materials under study; 6 - the thermocouple; 7 - a column with SiO_2-Cu^0; 8 - scrubber with 0.05 M Na_2SO_3 solution; 9 - the heating furnace of tubular type; 10 - columns with SiO_2-$AgNO_3$)

Before $CH_3{}^{131}I$ introduction

During experiment

Thermal decomposition of 100 mg $CH_3{}^{131}I$ in a gas flow on SiO_2-8Ni composite at 440°C

Thermal decomposition of $CH_3{}^{131}I$ (10 mg) in gas flow

(T_{gas} ~23°C, υ = 4.0-5.0 cm/s, S_{column} ~ 3.5 cm^2, a experiment time - 4 h)

Material	T, °C	Degree of ^{131}I sorption, %			Total degree of ^{131}I sorption, %	
		Material	Column with SiO_2-Cu^o	Scrubber with 0,05 M Na_2SO_3	Without thermal decompo-sition effect	With thermal decompo-sition effect
-*	540	-	~7,49	~0,004	~0	~7,50
-	550	-	~9,45	~0,004	~0	~9,50
-	640	-	~74,97	~0,004	~0	~75,00
-	760	-	~97,95	~0,004	~0	~98,00
Glass cylinders 4x4 mm	550	~0,004	~19,51	~0,003	~0	~19,51
Glass cylinders 4x4 mm	660	~0,03	~73,94	~0,015	~0	~73,99
SiO_2	240	~2,12	~0,03	~0,006	~2,12	~2,16
	350	~1,15	~8,99	~0,007	~1,15	~10,15
	460	~0,54	~76,20	~0,009	~0,54	~76,74
	540	~0,31	~96,75	~0,012	~0,31	~97,07
SiO_2-NH_4OH	340	~0,45	~7,99	~0,002	~0,45	~8,44
SiO_2-NH_4NO_3	340	~0,23	~3,09	~0,002	~0,23	~3,32
SiO_2-8Cu	240	~9.31	~4,40	~0,002	~9.31	~13,72
	340	~3.96	~58,14	~0,002	~3.96	~62,10
	450	~1.33	~91,80	~0,013	~1.33	~93,15
SiO_2-10CuNi (1:1)	235	~6.93	~1,60	~0,002	~6.93	~8,52
	345	~15.97	~51,19	~0,003	~15.97	~67,15
	445	~2.89	~94,96	~0,009	~2.89	~97,85
SiO_2-10CuNi(1:4)	250	~12.48	~7,15	~0,006	~12.48	~19,64
	350	~37.59	~51,62	~0,026	~37.59	~89,24
	480	~2.26	~96,45	~0,039	~2.26	~98,75
SiO_2-8Ni	260	~15.86	~12,68	~0,016	~15.86	~28,56
	340	~48.75	~38,88	~0,016	~48.75	~87,79
	450	~7.63	~91,82	~0,026	~7.63	~99,48

Thermal decomposition of $CH_3{}^{131}I$ in gas flow on SiO_2-8Ni composiite

(T_{gas} ~23°C, υ = 6.0-7.0 cm/s, S_{column} ~ 3.0 cm^2, a experiment time - 4 h, $m_{composite}$ - 10 g, $h_{composite}$ - 4.6-5.2 cm)

m($CH_3{}^{131}I$), mg	T, °C	Degree of ^{131}I sorption, %			Total degree of ^{131}I sorption, %	
		Material	Column with SiO_2-Cu^o	Scrubber with 0,05 M Na_2SO_3	Without thermal decomposition effect	With thermal decompo-sition effect
10	360	~48.75	~38,88	~0,016	~48.75	~87,79
50		~24.78	~64,57	~0,102	~24.78	~89,46
100		~13.05	~65,56	~0,308	~13.05	~79,10
10	450	~7.63	~91,82	~0,026	~7.63	~99,48
100		~2.56	~95,93	~0,002	~2.56	~98,50