Measurement of thermal conductivity of carbon nanomaterials

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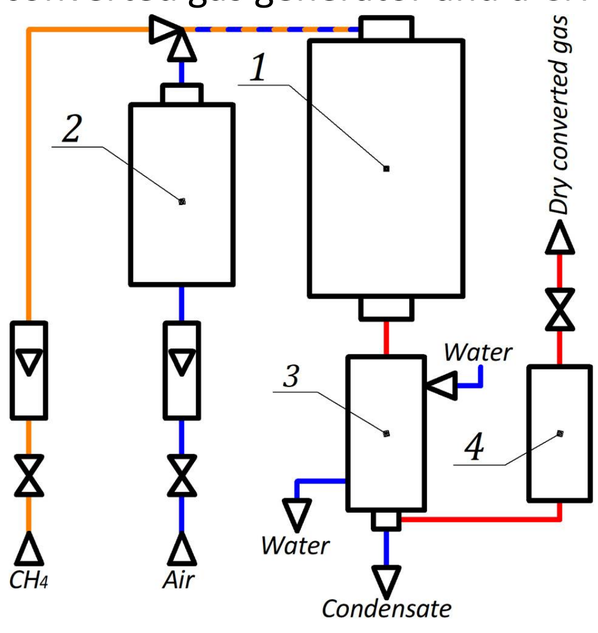
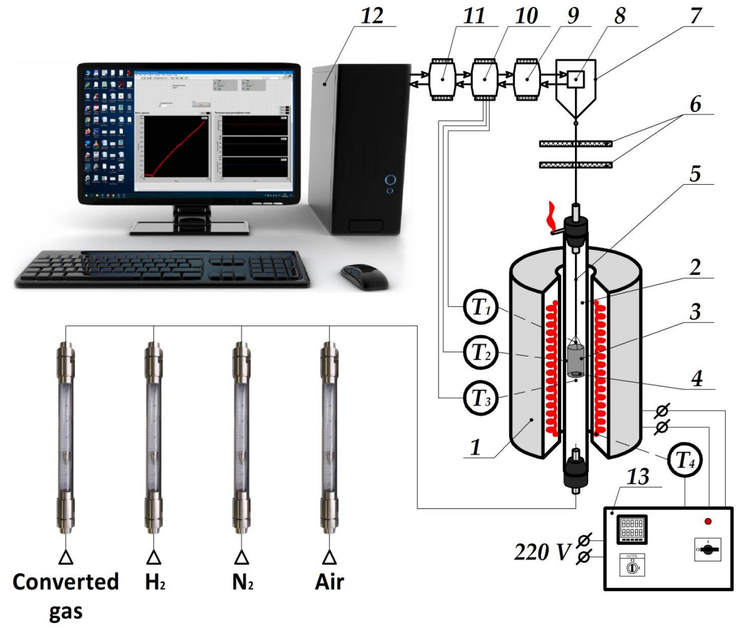
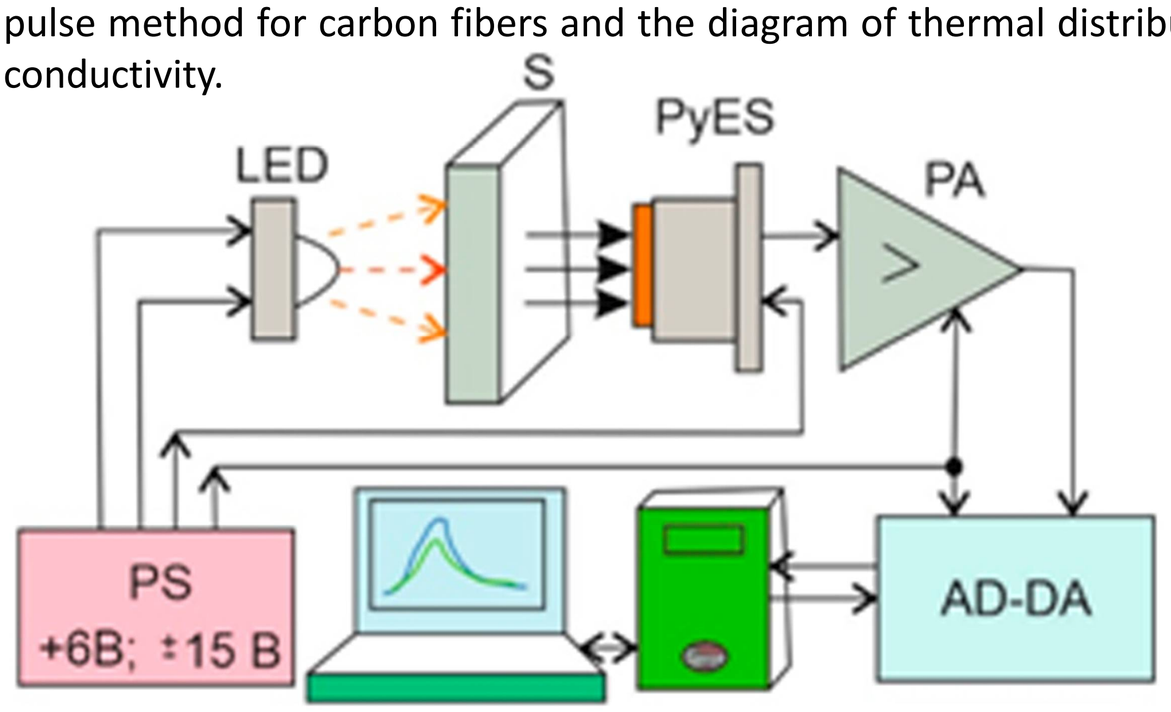
The method of carbon nanotubes (CNTs) synthesis by chemical vapor deposition (CVD) is widely used nowadays [1]. The advantages of CVD method are its simplicity and sufficient reproducibility, an available carbon precursor – hydrocarbon gases, and a CNTs yield of up to 95%. The possibility of sustainable growth of CNTs on surfaces of various shapes and sizes with low energy consumption is essential.
The figures below show iron ore pellets, a converted gas generator and a CNT (kinetic) plant.

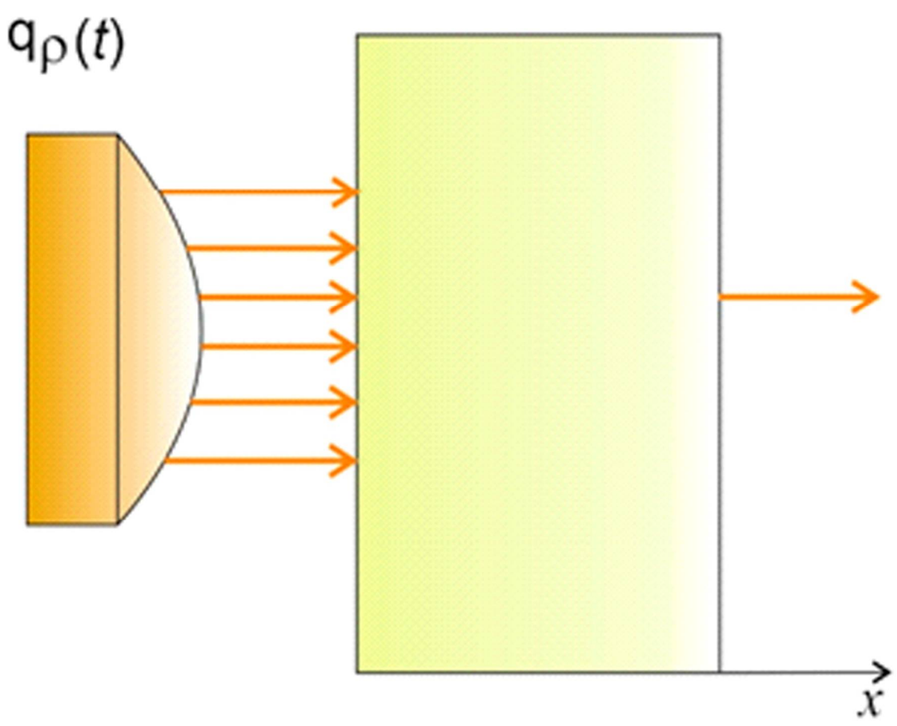




The study of the peculiarities of the processes of interaction of electromagnetic radiation (EMR) with carbon nanosystems is practically important and relevant. The characteristic of a substance called "thermal diffusivity", which is described by the coefficient of thermal diffusivity, is one of the physical quantities. It characterizes the rate of change or equalization of the temperature of the material in non-equilibrium processes that are related to thermal energy.

The figures below show the block diagram of the implementation of the measurement of thermal conductivity by the pulse method for carbon fibers and the diagram of thermal distribution during the pulse method of measuring thermal conductivity.





Thermophysical properties of carbon nanomaterials of various origins, including CNTs obtained by the CVD method, were studied using the impulse method of measuring thermal conductivity. Table shows the solution to the problem of thermal diffusivity calculation.

# sample	τ, air [10^{-3} s]	τ, sample [10^{-3} s]	Sample thickness, [10^{-6}, m]. L, m	χ, [m^2/s] $\cdot 10^{-6}$ Thermal conductivity
CNTs-1	329	897	1400	2,2
CNTs-2	329	608	1025	3,76
CNTs-3	329	694	980	2,63
CNTs-4	329	746	950	2,16
CNTs-5	329	985	950	1,4
Thermally expanded graphite	329	709	1060	2,97
Intercalated graphite	329	653	1005	3,12