

NANOSTRUCTURED CARBON IMPLEMENTATION IN CONSTRUCTION MATERIALS INDUSTRY

ZHDANOK S.A.

NATIONAL ACADEMY OF SCIENCES OF BELARUS

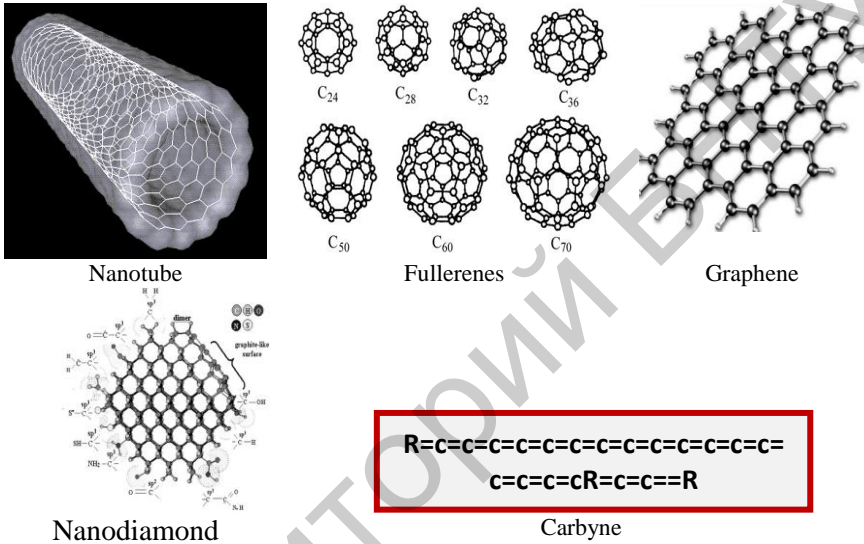


Fig. 1. Different Carbon Allotropic Forms

CNT can be described as a sheet of graphite rolled into a cylinder. Constructed from hexagonal rings of carbon. Can have one layer or multiple layers. Can have caps at the ends making them look like pills.

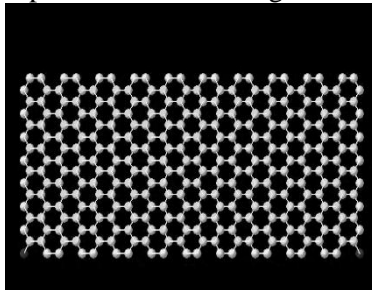


Fig. 2. Carbon Nanotubes

MWNT

- Consist of 2 or more layers of carbon
- Tend to form unordered clumps

SWNT

- Consist of just one layer of carbon
- Greater tendency to align into ordered bundles
- Used to test theory of nanotube properties

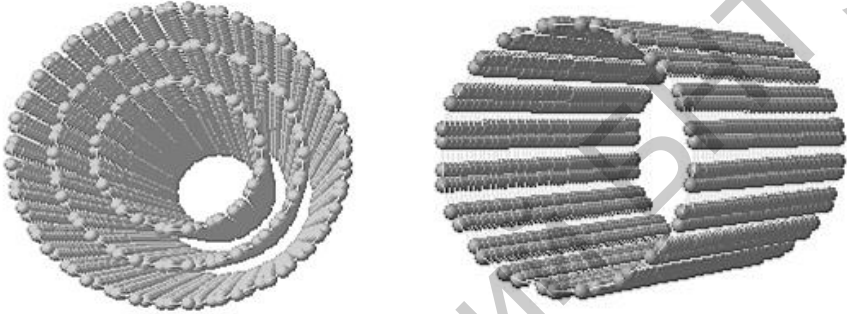


Fig. 3. Carbon Nanotubes Classification



Fig. 4. 1kg/hour CNT production facility

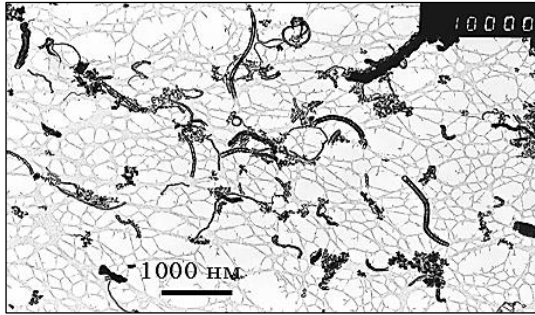


Fig. 5. Nanostructured carbon dispersion

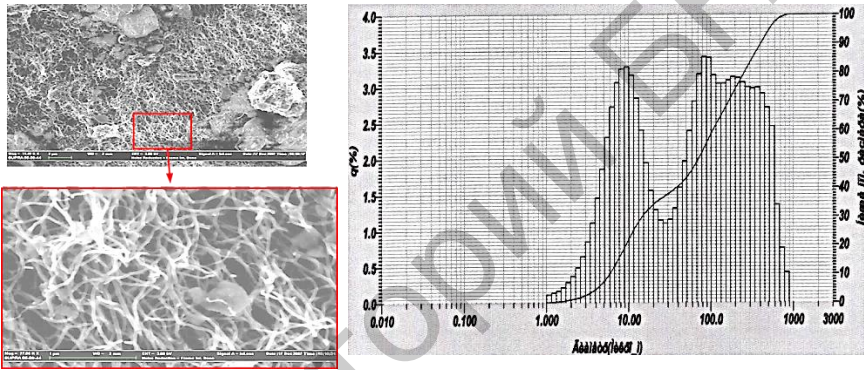


Fig. 6. Measurement of dispersed composition of the carbon nanomaterial as produced (Horiba particle Size distribution analyzer LA-950)

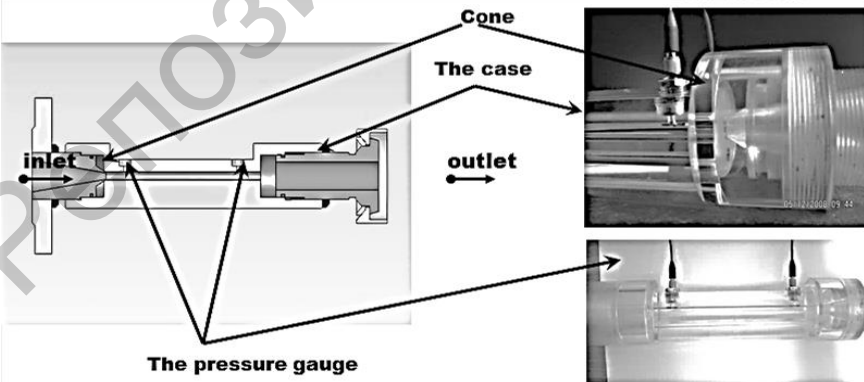


Fig. 7. Cavitation based art nano carbon dispersion unit

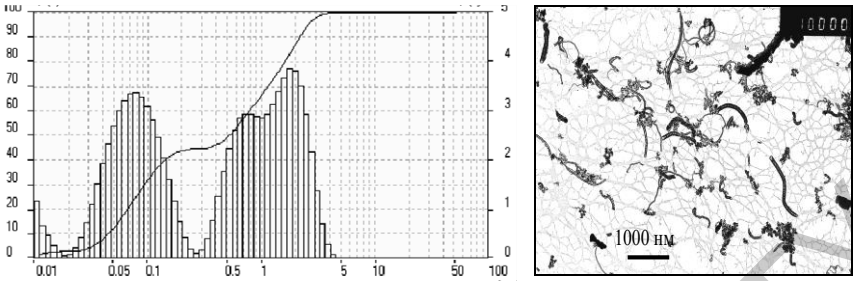


Fig. 8. SEM Picture of suspension

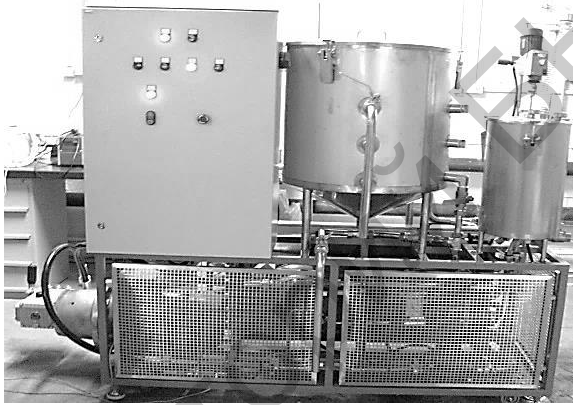


Fig. 9. Carbon dispersion facility

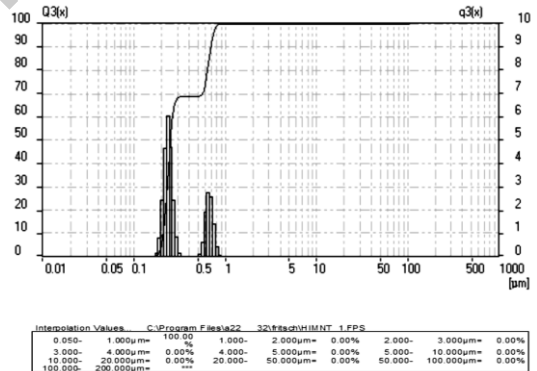
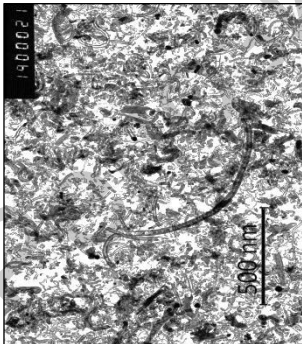


Fig. 10. Particles Size Distribution of ART NANO CARBON After Dispersion in Hydrodynamic Cavitation Facility

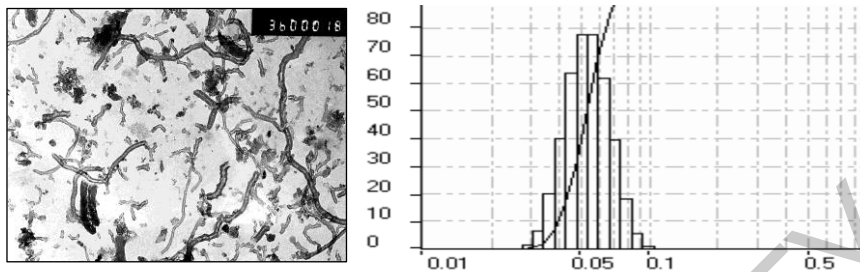


Fig. 11. Particles Size Distribution of ART NANO CARBON After Dispersion and Refining

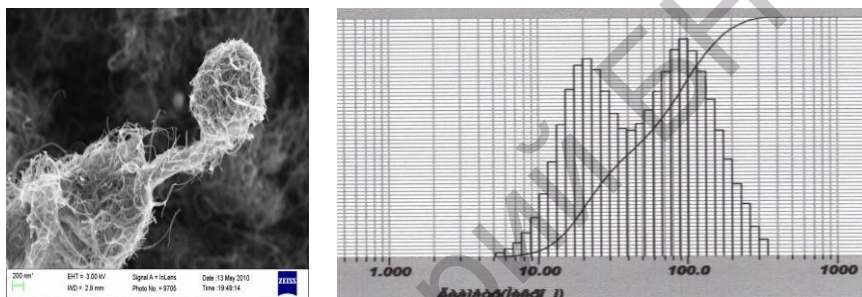


Fig. 12. Particles Size Distribution of C150P “BAYER” Carbon Nanotubes After Dispersion in Hydrodynamic Cavitation Facility

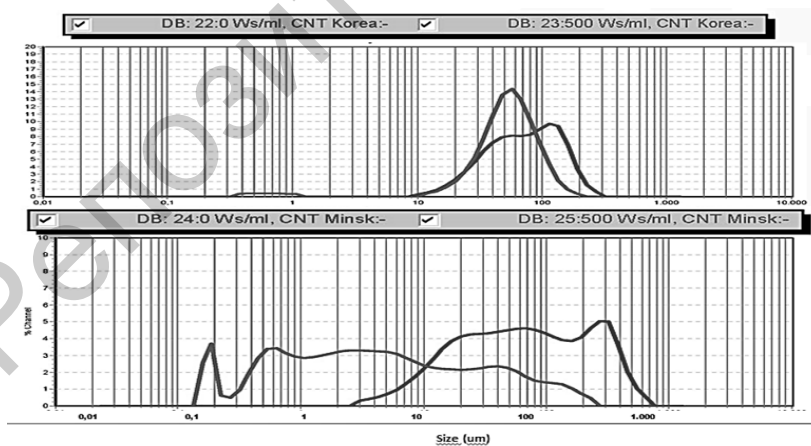


Fig. 13. Comparison of “ART Nano” Carbon Nanotubes and Korean(«Nano-Vision Tech») Carbon Nanotubes

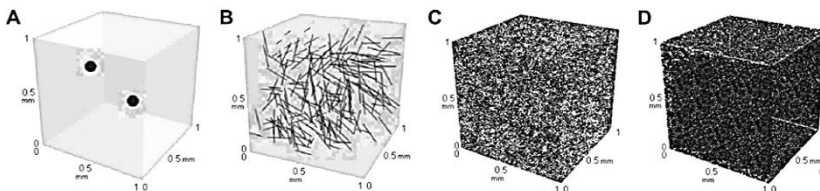


Fig. 14. Illustration of Different Size Nanostructured Carbon Particles Distribution Concentration 0.1% volume in 1 MM³.

- A – Agglomerated particles (Bayer, Nano-Vision Tech), $d = 100 \text{ MKM}$, $N = 2$; Surface=36S
 B – carbon fibers, $l = 5 \text{ MKM}$, $N = 255$; Surface=36S
 C – graphene plates, $l = 45 \text{ MKM}$, $\delta = 10 \text{ HM}$, $N = 6.6 \times 10^4$; Surface=1600S
 D – ART-Nano CNT, $l = 2 \text{ MKM}$, $d = 20 \text{ HM}$, $N = 4.4 \times 10^8$; Surface=100000S

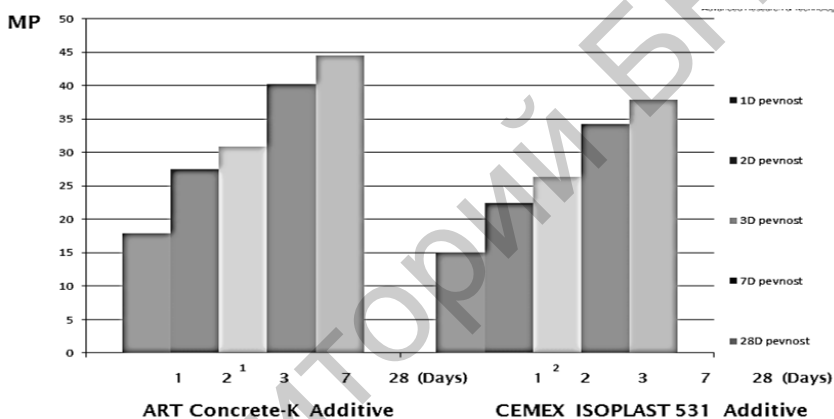


Fig. 15. Cemex-art carbon concrete additives strength tests results

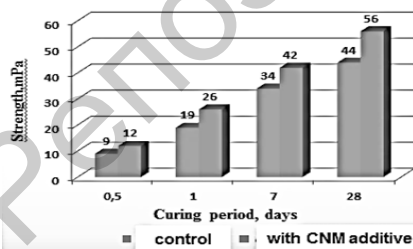


Fig. 16. Dependence of concrete strength on curing period for mixture #1 ART NANO CARBON content: 5.85 g/t of cement Strength increment on 28th day: 29%

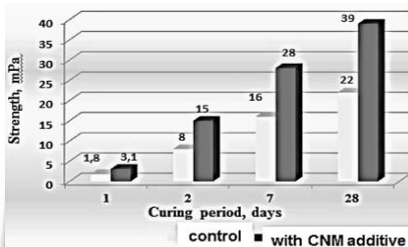


Fig. 17. Dependence of concrete strength on curing period for mixture #2 ART NANO CARBON content: 5.85 g/t of cement Strength increment on 28th day: 79%