# Model of a system of nanostructured plates covered by a magnetically sensitive coating

**Kovtunovych Vladyslav**[1]

[1] Institute of High Technologies, Taras Shevchenko National University of Kyiv, Glushkova ave., 4g, Kyiv-03187, Ukraine.

E-mail: valdis0239@gmail.com

## Problem Statement

Modern medicine needs more and more sophisticated technology to treat serious illnesses. Chemotherapy is usually used to treat cancer, but it is very harmful to the whole body, although it is enough to treat only the tumor itself. Chemotherapy does not guarantee the healing, and there is usually a long recovery of the organism after chemotherapy. Therefore, in order to avoid harm to the whole organism, it is necessary to act only on the tumor.[1]

## Methods

The concept of nanorobots, that are structures up to 200 nm in size, is proposed. They are constructed of non-magnetic material (black on the diagram) and magnetic material (gold on the diagram).These materials can be synthesized as nanostructured surfaces and cover some areas with magnetic material2 pre-placing the active substance inside.

The drug molecules (blue in the diagram) can be delivered to the affected areas of the body, bypassing healthy organs and minimize the impact on them. The solution with nanorobots should be introduced in the body and then activated by the magnetic field outside the body. Due to the action of the magnetic field the magnetic plates would to be attracted to each other, thereby destroying the inert shell and releasing the active substance directly to the affected area.The magnetic field can control and move the area of action of the drug as needed. Upon completion, the residual materials are excreted naturally.

## Results

The picture shows the results of the simulation of the nanorobot. The first part is a stable state in which drugs cannot affect the body because they are covered by an inert shell. The second picture shows the beginning of the destruction of the nanostructure under the action of an external magnetic field and the release of drugs.[3] The third picture is a nanorobot which has completed its task and all the active substance left the shell in the affected area. The remnants of the nanoshell should not affect the body. Using such "couriers" it is more expedient to use already existing medicines, reducing influence on all organism[4], or to use more powerful drugs for faster recovery. We can allow this, because the body will receive much less unnecessary damage, even from stronger drugs.

## Conclusions

The mechanical method of influencing the treatment process may be very useful and new. After all, now it is possible to control treatment only through chemical or biological triggers.[5] However using physical action the greater control over the process and its urgent stop (in bad case) may be achieved.We are open for collaboration and would be grateful to you for your comments and propositions. Do not hesitate to contact us.

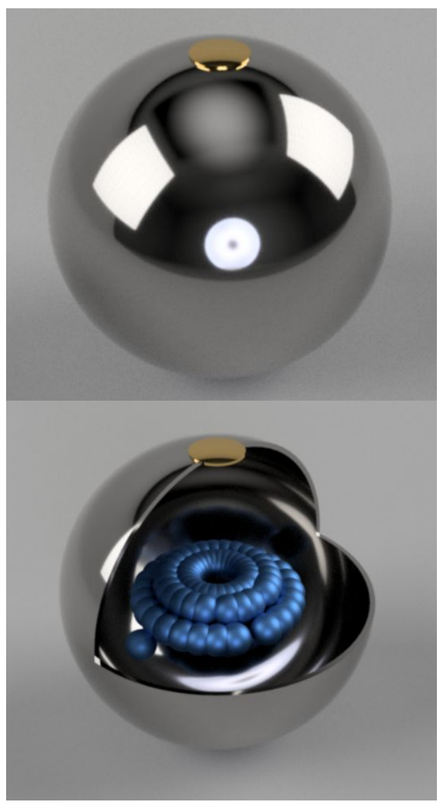
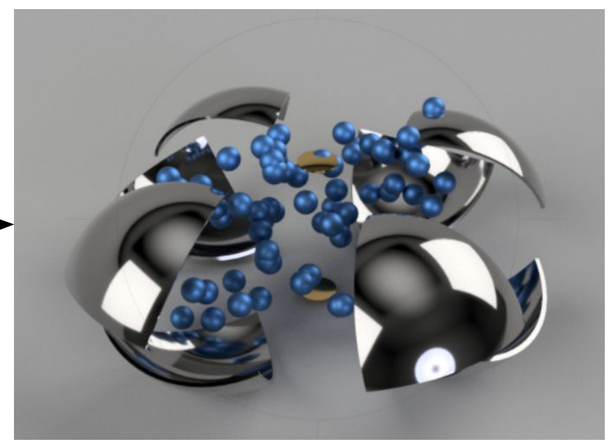


Fig 1.Nanorobot model

Influence of magnetic field

Fig 2. Nanorobot after the action of a magnetic field

Fig 3. Release of the drug



SCAN For More Information

## References

1. *Syed Abeer. JIMSA July-September 2012 Vol. 25 No. 3 — Future Medicine: Nanomedicine. University of Glasgow, United Kingdom*
2. *Bhat A.S. I.J.E.M.S., VOL.5 (1) 2014:44-49 - NANOBOTS: THE FUTURE OF MEDICINE. Department of Instrumentation and Control, College Of Engineering, Pune (COEP), Shivajinagar, Pune-411005, Maharashtra, India*
3. *Ghosh A, Fischer P: Controlled propulsion of artificial magnetic nanostructured propellers. Nano Lett. 9(6), 2243–2245 (2009).*
4. *Beasley RA, Medical robots: current systems and research directions, Journal of Robotics 2012, 401613, 1–14 (2012).*
5. *Wang J, Gao W, Nano/microscale motors: biomedical opportunities and challenges. ACS Nano 6, 5745–5751 (2012).*