

## Magnetic materials for wireless actuation in biomedicine

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This talk introduces the key aspects of magnetic actuation for medical devices in the miniature scale, based on the author experience on robotics for minimally invasive intervention, targeted therapy, personalized medicine and bionic artificial organs. The quest for miniaturization and natural access to the targeted pathologies led to the development of diagnostic and therapeutic tools to be delivered with an endoluminal and transluminal approach - such as endoscopic capsules - and to be controlled and propelled by remote operation schemes from outside. The quest for targeted therapy has

recently opened new opportunities for robotic technologies, which are used more and more as controllers for the delivery of drugs embedded in nanobiotech vectors and as solutions for making therapy really localized in the area of interest, thus enabling on-demand release kinetics and eliminating (or strongly limiting) side effects. After a description of magnetic solutions developed by the authors' group for actuating, locomoting and triggering mechanisms to be employed in medical devices, the talk will focus on recent applications of magnetic control. Examples range from magnetic control and triggering for drug delivery capsules to be used in the spine, to magnetic activation mechanisms for artificial organs (i.e. urinary sphincters or artificial pancreas), and magnetic microfilms manipulation for personalized therapy and lab-on-chip technologies.

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