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# Nanowires as innovative building blocks for optoelectronics

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### Abstract

Electronics powers the world since the invention of the first transistor in 1925. Wherever we look around us, we see electrically powered devices based on Silicon. Silicon is just great: it is cheap, easy to work with, widespread and well known. for basic electronics - it works just fine and trying to find something better than silicon is just like trying to improve gunpowder. Silicon has though is limitations and they are already met nowadays: the latest trends point toward smaller and smaller devices with brilliant colours. The first is basically treated in nanotechnology: when the dimensions of an object are of the same order of magnitude of the electrons mean free path, we achieve an effect known as quantum confinement, because of which the energy of the electrons increases and the properties of materials change accordingly. The second is well known in optoelectronics. Silicon is an indirect band semiconductor, which basically means that its interaction with light is hindered and makes it not the best candidate for optically active devices. There are objects in the nanotechnology world that are aimed to help with both these moments: they are called nanowires and are very thin but arbitrarily long crystals made of different materials, such as III-V or II-VI semiconductors. Such crystals can be obtained spontaneously under the right conditions of pressure, temperature and available atoms in what is commonly called "vapour-liquid-solid growth". In such processes, a monocrystal is used as the substrate on which liquid droplets of a catalyst material drive the "growth" of the crystal using atoms incoming from the vapour phase. The size of the liquid droplet determines the diameter of the Nano crystals and the growth time affects their length. Such crystals can then be "surrounded" by a layer of different material in a core-shell fashion by changing the composition of the atoms in the vapour phase. The so obtained Nano-hot-dog can be employed as a sun active element, because upon impinging of solar light, electron-hole pairs are generated, the charge bearers separate between the core and the shell material de facto producing a potential difference, Et voila' we obtained a high efficiency solar cell: we only need to connect the two layers separately, close the electrical circuit, protect them with a non-absorbing additional layer to prevent atmospheric agents from damaging our device.

### Biography

Prof Dr S. Filo Amboina, PhD (aka Filo) is a former scientist, previous technical salesman, now Chemistry Lab Director and Professor of Chemistry with over twenty years international experience. Not only did he discover an innovative way of growing one-dimensional Nano crystals without foreign elements during his PhD thesis, but also stepped further into the realization of devices. Successful international sales manager, he eventually started teaching chemistry and nanotechnology at Sirius University, Russia. Expert of Italian art, science communicator and polyglot, Filo is the right choice when you want to debate about something difficult, beautiful or funny.

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