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Indium Nanoparticles – technology assessment for commercialization and innovation opportunities using patents as indicators

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Indium Nanoparticles – Technology Assessment for commercialization and innovation opportunities using patents as indicators: This research postulates a mechanism to identify new commercialization avenues for an inter-disciplinary technology portfolio through innovation mapping. The mechanism may be deployed for adding leverage to influence or market power of an existing technology as well. Patent informatics in form of technology spill-over analysis and technology competitiveness assessment is used herein. Both these factors are known innovation drivers and can be leveraged for mapping innovation and commercialization opportunities. Patents are a good indicator because inter-disciplinary technologies like nanotechnology progress through identifiable patterns of scientific, technological and economic developments and there is a time lag between different stages. Accordingly, patent documents can be used for studying technology influence and market power of portfolios and innovation network can be derived thereupon. Example of Indium Nanoparticles has been used to demonstrate aforementioned statement through a multi-dimensional analysis at a primary level and involving patent citations, family size, technical applications and bibliographic information provided in 1623 relevant patent documents. The analysis lead to mapping of technology spill-overs and competitiveness, which were later compared and remapped at secondary and tertiary levels to form detailed innovation map for the technology. Indium Nanoparticles have applications as a material for superconductivity, and as a semiconductor. The innovation map created through assessment presents evidence of possible applications and opportunities of innovation for indium nanoparticles in electrical, magnetic, optical, biomedical and bioscience sectors. These opportunities may be leveraged through various strategic decisions thereby opening a plethora of commercialization avenues like technology pooling, cross-licensing etc.

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Graphene and carbon nanotube thermoelectric transducers

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Using the local thermoelectric cooling on nanoscale enables exploiting of the low-temperature phenomena at ambient temperatures with no needs in bulky and expensive refrigerating equipment, thereby opening new horizons for many approaches and methodologies. The key idea is to apply an energy-efficient cooling to individual transistors or quantum dots with a pin-point precision, concentrating on small limited areas, thereby dropping the necessity to refrigerate bulky devices. We conduct the experimental study and theoretical modelling of thermoelectric cooling observed in the Carbon Nanotube (CNT), whose opposite ends contain the charge carriers of opposite sign, either electrons or holes, created by doping with using of the local gate electrodes. Finite source-drain electric bias voltage *V* causes change of the local effective electron temperature Te at the middle of CNT, owing to the Peltier effect, whilst the magnitude is deduced from the change in the position and width of spectral singularities, which is manifested in the experimental curves of the source-drain electric conductance. We find that using the electrode doping, one achieves a sharp rise of both, the electric conductivity and Seebeck coefficient, while the thermal conductivity tumbles. Such the effect of thermal transistor improves the figure of merit of the thermoelectric transducing circuits. Depending on the sign of V, the thermoelectric effect causes either cooling or heating of the electron subsystem inside CNT, with the Te change ~70 K. The value of deduced figure of merit is ZT~10 and the cooling power density is ~ 80 kW/cm^2.

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