

## Energy research Centre of the Netherlands (ECN)

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ECN is one of the leading institutes in Europe concerning applied energy research. ECN's mission is to contribute to a future sustainable energy system by performing research and technology development and bringing it into implementation. ECN is experienced in the definition and execution of projects in the R&D area between universities and industries and is funded on a contract basis. Contracts are obtained from the Dutch government and from national and international organisations and industries. ECN has about 700 employees that work in the field of solar and wind energy, biomass conversion, clean use of fossil fuels, energy efficiency in industry and the built environment, policy studies and environmental aspects of energy supply.

In the unit ECN Solar Energy approximately 80 scientists and engineers are involved in photovoltaics R&D. A full research programme is carried out on crystalline silicon wafers and ribbons, cells and modules and on thin film PV technology, including thin-film silicon, dye sensitized oxide and polymer solar cells. In the unit ECN Energy in the Built Environment work is carried out on PV system technology and on the physical and electrical integration of PV in the built environment.

The Organic based PV activities at ECN comprise about 10 fte and are carried out in full synergy with the R&D on multicrystalline silicon, thin film silicon photovoltaics and module technology. The work is carried out in close collaboration with industry, research institutes and universities, in the framework of national and international R&D programs on PV. The Organic based PV research is conducted in the field of Dye-sensitized solar cells (liquid and solid state versions) and polymer based solar cells in the following areas:

- Materials development: preparation of metal oxide nanoparticles, nanorods and (screen) printable pastes
- Reproducible fabrication of Dye-sensitized solar cells and modules on a semi-automated laboratory pilot line using polymer hotmelt and glass frit sealing
- Manufacturing technology: design and fabrication of production equipment
- Operation of a laboratory processing line for polymer based solar cells: device optimisation and solar cell characterisation under inert atmosphere
- Process development (deposition methods like spincoating, screenprinting, doctorblading, casting, encapsulation)
- Development of new cell and module designs: application of luminescent coatings, concentrators, multi-junctions
- Accurate solar characterization at Standard Test Conditions following IEC and ASTM norms ( I-V, Spectral response) and local beam techniques like LBIC
- Advanced characterization of dye and polymer solar cells via Electrical Impedance Spectroscopy and Transient current and voltage methods
- Accelerated and outdoor lifetime testing. Infrastructure includes UV and/or visible light soaking, thermal aging, periodic cycling tests in climate chambers, outdoor monitoring system
- Outdoor performance assessment of various PV technologies