Engineers design silicon-free photoelectric module of easy incorporation

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A team of researchers at the Ikerlan-IK4 technological centre have made a laboratory-scale photoelectric panel which, apart from fulfilling the function of converting solar light into electricity, solves the problems of integratability and availability that current technology presents.

The installation of solar photoelectric panels - capable of converting the sun's light energy into electricity for its subsequent use in households or for sale to an energy supply company - has taken place at such a frenetic pace in recent years that it has given rise to a demand that is greater than the production capacity of the manufacturing companies.

On the one hand, legislation obliges the installation of solar panels on all local authority buildings of new construction. Likewise, tariffs for the sale of electrical energy, favourable to individuals selling to energy suppliers, have been set. This has encouraged the construction of many small energy-producing stations - also called solar gardens - by small investors, who have seen solar photoelectric energy as a way of assuring or increasing their pension plans.

Nevertheless, the growing demand for panels, and especially the raw material needed for their manufacture - mono or multi-crystalline silicon -, has made the end price for installation rise to such levels that the period of redemption is greater even than the guaranteed life of the solar panels. More conflictive is perhaps the dependence on the producers of these cells (most of which are located in Far Eastern countries) and created by the module assembly and installation companies - Spain being

a leading country in this respect. Although this scarcity of raw material has been sometimes described as transitory and it this has been repeated actively or passively that the production of cells has increased, the price per panel continues to be relatively high - an so other kinds of investment, despite having very low interest rates, continue to be more profitable.

Apart from the price, the traditional photoelectric technology based on silicon panels that are voluminous, heavy, opaque and dark, also finds widespread rejection in the construction sector. Architects, obliged by law to implement it in buildings, do not find easy solutions, limiting the installation to places with little visual impact, such as roofs and terraces.

For these reasons, one of the most innovative lines of research worldwide is the quest for new materials that comply with the function of converting solar light into electricity and, at the same time, solve problems of integratability and availability that are present in current technology.

The photoelectric panel made by the research team from Ikerlan-IK4 technological centre met with all expectations. This panel was manufactured with plastic materials - known as organic polymers - the production of which was carried out in chemical laboratories and, thus, their availability practically infinite.

But, without doubt, what has made the most impact is their appearance and design, it being possible to make them in different colours and involving a fine coating of plastic that can be deposited on almost any kind of surface, whether rigid or flexible. The versatility and simplicity of the manufacturing processes and the low cost of this technology make the fields of application limited only by the imagination of the researchers and industrial promoters. The sector benefiting most could precisely be that of construction, given that this technology enables the

manufacture of semitransparent windows or photoelectric curtains which allow certain passage of light to the interior and, at the same time, convert part of this solar energy into electricity.

Neither is the textile sector left out of these advances, as chargers for portable electronic devices, such as mobile telephones or reproducers of music may be incorporated into garments, bags or even tent material for aficionados of camping.

Research into these types of materials is increasingly more common, with many countries having national research programmes dedicated exclusively organic photoelectric technology. Ikerlan-IK4 launched their activity in this field two years ago and the results could not have been better. Recently, photoelectric conversion efficiencies were measured as being above 4% in photoelectric cells manufactured at Ikerlan's own laboratories with solar simulators officially approved at photoelectric panel specification centres unconnected to Ikerlan.

Likewise, the manufacture of modules is not simple, as different individual cells have to be electrically connected on the same substrate during their manufacturing process. The semitransparent module built by Ikerlan is 30 mm x 30 mm and connects 16 individual cells on the same glass substrate. It is the first example constructed within Spain and one of the few on the international stage. This advance demonstrates the viability and potential of organic photo-electricity and is a further stride on the road to the industrialisation of this technology.

Ikerlan is currently working on alternative designs to produce larger sized panels which can be of use in various applications, from small panels to replace batteries in portable electronic devices to large modules for installing in roofs and walls, without visual impact and respecting the architectural aesthetics of the building and its surroundings.

Source: Elhuyar Fundazioa