Light sensor breakthrough could enhance digital cameras

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New research by a team of University of Toronto scientists could lead to substantial advancements in the performance of a variety of electronic devices including digital cameras.

Researchers created a light sensor - like a pixel in a digital camera - that benefits from a phenomenon known as multi-exciton generation (MEG). Until now, no group had collected an electrical current from a device that takes advantage of MEG.

"Digital cameras are now universal, but they suffer from a major limitation: they take poor pictures under dim light. One reason for this is that the image sensor chips inside cameras collect, at most, one electron's worth of current for every photon (particle of light) that strikes the pixel," says Ted Sargent, professor in U of T's Department of Electrical and Computer Engineering. "Instead generating multiple excitons per photon could ultimately lead to better low-light pictures."

In solar cells and digital cameras, particles of light - known as photons - are absorbed in a semiconductor, such a silicon, and generate excited electrons, known as excitons. The semiconductor chip then measures a current that flows as a result. Normally, each photon is converted into at most one exciton. This lowers the efficiency of solar cells and it limits the sensitivity of digital cameras. When a scene is dimly lit, small portable cameras like those in laptops suffer from noise and grainy images as a result of the small number excitons.

"Multi-exciton generation breaks the conventional rules that bind traditional semiconductor devices," says Sargent. "This finding shows that it's more than a fascinating concept: the tangible benefits of multiple excitons can be seen in a light sensor's measured current."

Source: University of Toronto (news : web)