



EPFL

Bienvenue à l'EPFL

Yasmine Calisesi
Directrice opérationnelle
Centre de l'Energie (CEN)

Mars 2020

■ Ecole polytechnique fédérale de Lausanne

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EPFL

Les trois missions de l'EPFL selon le mandat fédéral

- Enseignement
- Recherche
- Innovation


ENERGY CENTER (CEN)

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L' EPFL aujourd'hui

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Campus

- 11'500 étudiants/es, dont 2'200 doctorants/es
- 344 professeurs/es
- 6'100 employés/es (y.c. doctorants/es)

Structure

- 5 Écoles (13 progr. d'études niveau Master)
- 2 Collèges
- 20 Instituts
- 44 Centres de recherche
- 371 Laboratoires

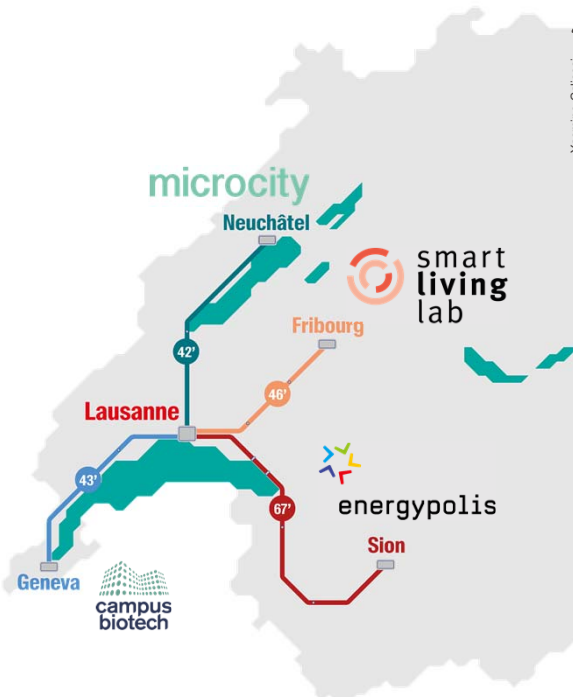
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Un campus élargi

- Neuchâtel** – Microcity
- Fribourg** – Smart Living Lab
- Lausanne** – Campus principal
- Sion** – Energypolis
- Geneva** – Campus Biotech



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EPFL **Le Parc d'innovation**
Un mélange précieux d'industries

TECHNOLOGIES DE L'INFORMATION - FINANCE - INFORMATIQUE

AXA TECH, CISCO, CREDIT SUISSE, ELCA, la.Mobilière, logitech

MAGIC LEAP, swisscom, VIASAT, CYD CYBER SERVICE CAMPUS

SANTÉ - NUTRITION

ACImmune, Agilent Technologies, BUHLER, Firmenich

MERCK, Nestlé Institute of Health Sciences, SIEMENS Healthineers

INGÉNIERIE - TRANSPORTS - MATERIAUX

BRÜKER, maxon motor, Namiki, PSA GROUPE, ROLLOMATIC, ROMANDE ENERGIE, Schindler, SONCEBOZ, SBB CFF FFS

SWITZERLAND INNOVATION PARK NETWORK NEST EPFL

... et > 120 start-ups
> 75 projets d'entreprises

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EPFL **La R&D en Énergie à l' EPFL :**
une vaste entreprise...

Systèmes, Réseaux, Renouvelables, Digitalisation

Mobilité et transports, Environnement

Materiaux, Efficacité, Stockage, Socio-economie, Fusion

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Le Parc solaire Romande Energie - EPFL

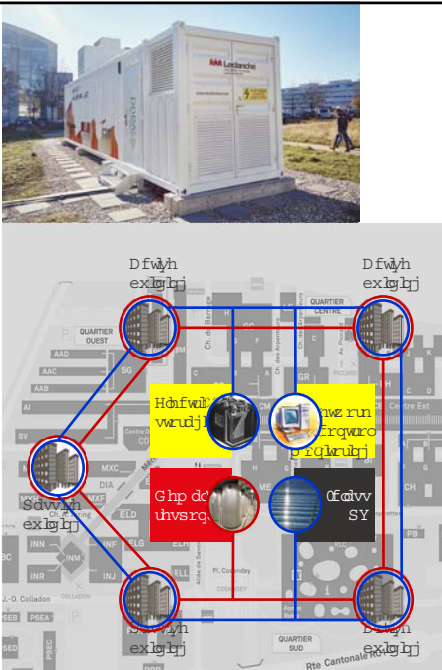
- Inauguré en 2015
- 15'500 m²
- 25 toitures
- 2.2 Mio kWh/an
- Recherche et enseignement

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La plateforme Smart Grid de l' EPFL

- Prédiction de la production renouvelable par le Machine-learning
- Interaction de sources d'énergie renouvelables de l'ordre du MW et de systèmes de stockage
- Schémas de contrôle centralisés vs décentralisés
- Connaissance de l'état du système en temps réel
- Application de l'internet des objets (IoT) aux systèmes électriques
- Gestion de la demande
- Réseau capable d'autoréparation

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Une idée fixe: les pérovskites

REVIEWS

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Dimensional tailoring of hybrid perovskites for photovoltaics
Giulio Grancino^{1,*} and Mohammad Khaja Nazeeruddin^{2,*}

Abstract | Hybrid perovskites are currently one of the most active fields of research owing to their immense potential for photovoltaics. The performance of 3D hybrid organic-organic perovskite solar cells has increased at an incredible rate, reaching power conversion efficiencies comparable to those of many established technologies. However, the commercial application of 3D hybrid perovskites is inhibited by their poor stability. Relative to 3D hybrid perovskites, low-dimensional – that is, 2D – hybrid perovskites have demonstrated higher moisture stability, offering new approaches to stabilizing perovskite-based photovoltaic devices. Furthermore, 2D hybrid perovskites have versatile structures, enabling the fine-tuning of their optoelectronic properties through compositional engineering. In this Review, we discuss the state of the art in 2D perovskites, providing an overview of structural and materials engineering aspects and optical and photophysical properties. Moreover, we discuss recent developments along with the main limitations of 2D perovskites and assess the advantages of 2D perovskites over their 3D parent structures in terms of stability. Finally, we review recent achievements in combining 3D and 2D perovskites as an approach to simultaneously boost device efficiency and stability, paving the way for mixed-dimensional perovskite solar cells for commercial applications.

FULL PAPER
Hybrid Perovskites

Retarding Thermal Degradation in Hybrid Perovskites by Ionic Liquid Additives
Rui Xia, Zhaofu Fei, Nikita Drigo, Felix D. Bobbink, Zhangjun Huang, Rokas Jasutanas, Marius Franckevičius, Vidmantas Gulbinas, Mounir Mensi, Xiaodong Fang, Cristina Roldán-Carmona,[†] Mohammad Khaja Nazeeruddin,^{*} and Paul J. Dyson[‡]



ACS Energy LETTERS

25.1%-Efficient Monolithic Perovskite/Silicon Tandem Solar Cell Based on a p-type Monocrystalline Textured Silicon Wafer and High-Temperature Passivating Contacts
G. Nogay,^{1,2,3,4,5,6} F. Sahli,^{1,3} J. Werner,^{1,6} R. Monnard,¹ M. Boccard,¹ M. Despeisse,¹ F.-J. Haug,¹ Q. Jiang,^{1,6} A. Ingento,¹ and C. Ballif^{1,2,3}

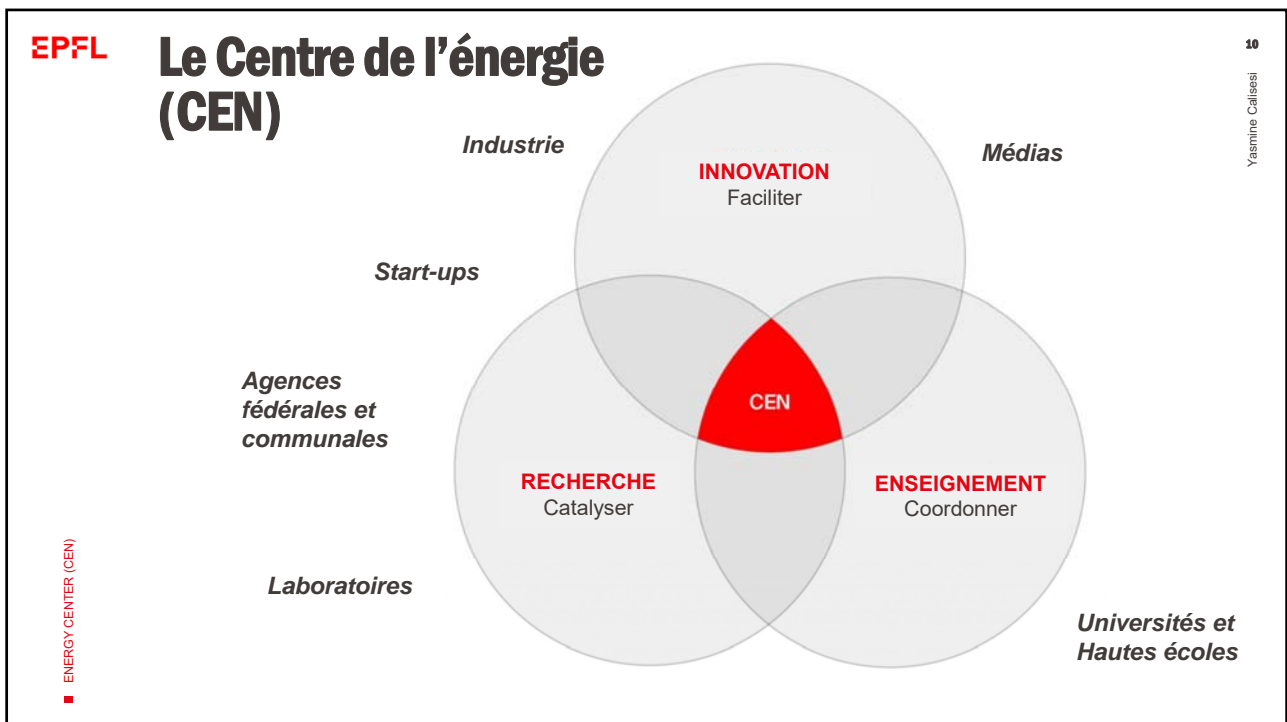
¹ Ecole Polytechnique Fédérale de Lausanne (EPFL), Institute of Microengineering (IMEP), Photovoltaics and Thin-Film Electronics Laboratory, Rue de la Maladière 17B, 2000 Neuchâtel, Switzerland
² CSEM, PV Center, Jussieu Drive 1, 2003 Neuchâtel, Switzerland

ChemComm

FEATURE ARTICLE

Morphological and compositional progress in halide perovskite solar cells
Hui-Seon Kim,^{1,*} Anders Hagfeldt^{1,2,*} and Nam-Gyu Park^{1,3}

Perovskite solar cells (PSCs) reached a certified 23.7% efficiency in 2018 by boosting their surprisingly high open-circuit voltage (V_{oc}) and photocurrent. The suppressed recombination in PSCs significantly cut down the voltage loss between the bandgap energy and V_{oc} , which encouraged the V_{oc} to reach closer to the bandgap. In addition, the photocurrent is considerably closer to the theoretical value at a given bandgap, leaving almost no room for further improvement. This remarkable development in the performance of PSCs is mostly ascribed to high-quality perovskite material being consistently fabricated in the progress of technology. At the beginning of the progress, the morphology of the perovskite was a major target for improvement to enhance the crystal quality. The need for compositional engineering of the perovskite was raised in later stages of the progress by considering the benefits from different compositions of perovskites and their structural stability. Here we review the overall progress in perovskite materials from two perspectives: morphological progress and compositional progress.





Le meilleur de trois mondes

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Tradition Suisse

- EPFs créées en 1848 (ETHZ) et 1969 (EPFL) pour favoriser l'innovation
- Proches de l'économie et de la société
- Large autonomie (facteur-clé de succès)
- Recherche disruptive comme force motrice et condition-cadre pour l'enseignement et l'emploi en suisse

Culture européenne

- Contrat social
- Généreux financement public (qui inclut la CH)
- Large heritage culturel

Système anglo-saxon

- Tenure track pour tous/tes les professeurs/es-assistants/es
- École doctorale pour tous les doctorants/es








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L' « esprit EPFL »...

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EPFL L' « esprit EPFL »: et si...



GENEVA TO ZURICH
250KM - 17 MINUTES
CHF 6.- / PASSENGER

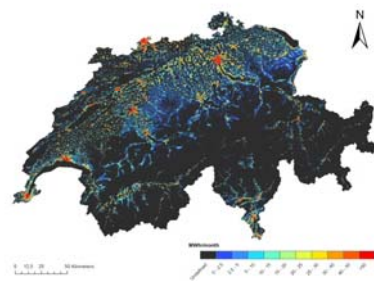










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Swiss Solar Boat

What if half of Switzerland's rooftops produced electricity?

 6 m ²	 15 kts croisière	 1500 Wh
 140 Kg	 30 kts pointe	 7 m

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EPFL L' « esprit EPFL »: et si...

SCIENCE ADVANCES | RESEARCH ARTICLE

VIROLOGY

Modified cyclodextrins as broad-spectrum antivirals

Samuel T. Jones^{1,2*}, Valeria Cagno^{1,3*}, Matej Janeček¹, Daniel Ortiz⁴, Natalia Gasilova⁴, Jocelyne Piret⁵, Matteo Gasbarri¹, David A. Constant⁶, Yanxiao Han⁷, Lela Vukovic⁸, Petr Kral^{2,9}, Laurent Kaiser¹⁰, Song Huang¹¹, Samuel Constant^{1*}, Karla Kirkegaard⁷, Guy Boivin⁵, Francesco Stellacci^{1,2,12}, Caroline Tapparel^{1,12}

Viral infections kill millions of people and new antivirals are needed. Nontoxic drugs that irreversibly inhibit viruses (virucidal) are postulated to be ideal. Unfortunately, all virucidal molecules described to date are cytotoxic. We recently developed nontoxic, broad-spectrum virucidal gold nanoparticles. Here, we develop further the concept and describe cyclodextrins, modified with mercaptoundecane sulfonic acids, to mimic heparan sulfates and to provide the key nontoxic virucidal action. We show that the resulting macromolecules are broad-spectrum, biocompatible, and virucidal at micromolar concentrations in vitro against many viruses (including herpes simplex virus (HSV), respiratory syncytial virus (RSV), dengue virus, and Zika virus). They are effective ex vivo against both laboratory and clinical strains of RSV and H5N1 in respiratory and vaginal tissue culture models, respectively. Additionally, they are effective when administered in mice before intravaginal H5N1 inoculation. Lastly, they pass a mutation resistance test that the currently available anti-HSV drug (acyclovir) fails.

Le sucre, nouvelle arme contre les virus



Des chercheurs de l'Université de Genève, de l'EPFL et de l'Université de Manchester sont en passe de renforcer l'arsenal thérapeutique de lutte contre les virus: un traitement révolutionnaire à base de sucre permettrait de détruire les virus et pourrait contribuer à la lutte contre diverses épidémies virales, dont probablement le coronavirus qui sévit actuellement en Chine.

29.01.20

MOTS-CLÉS
STI virus

ACTUALITÉS
• Toutes les actualités EPFL
• Toutes les actualités

ABONNEMENT

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