High-efficiency monolithically integrated CIGS submodules on metal foils

Demonstration of over 15 %-efficiency CIGS submodules

We have developed monolithically integrated CIGS submodules with efficiencies of as high as 15.0 % on stainless steel substrates. The surface of the stainless steel substrate was coated with an anodized Al_2O_3 layer which makes the monolithic integration possible. The demonstration of high-efficiency flexible submodules on low-cost substrates can lead to a wide variety of applications such as car, space, and power applications, in addition to exsisting niche and mobile applications.

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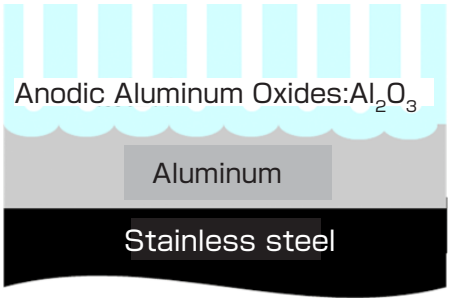
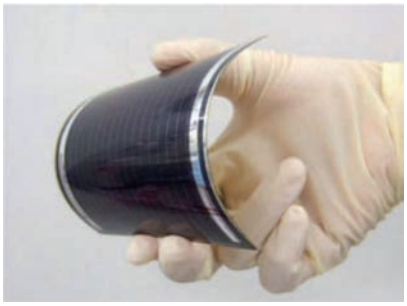
AIST TODAY Vol.11 No.12 p.12 (2011)



Cross-sectional image of the stainless steel substrate used in this work



Overall appearance of a monolithically integrated CIGS submodule on stainless steel substrate

Mechanism of template-independent RNA polymerization

A tale of a polyA tail – how to get all As

PolyA polymerase (PAP) adds a polyA tail onto the 3'-end of RNAs without a nucleic acid template, using ATP as a substrate. The mechanism for the selection of substrates by eubacterial PAP remains obscure. Structural and structure-based biochemical studies of *Escherichia coli* PAP (EcPAP) revealed that both the shape and size of the nucleobase-interacting pocket of EcPAP are maintained by a rigid intra-molecular hydrogen-bonding-network. It makes the pocket suitable for the accommodation of only ATP using a single amino acid residue in the pocket. The rigidity of the pocket structure of EcPAP is sustained by interactions between the catalytic core domain and the RNA-binding domain. EcPAP has a flexible, unstructured, basic C-terminal region that functions as an RNA translocator for processive RNA polymerization. A comparison of the EcPAP structure with those of other template-independent RNA polymerases suggests that structural changes of domain(s) outside the conserved catalytic core domain altered the substrate specificities and processivities of the template-independent RNA polymerases.

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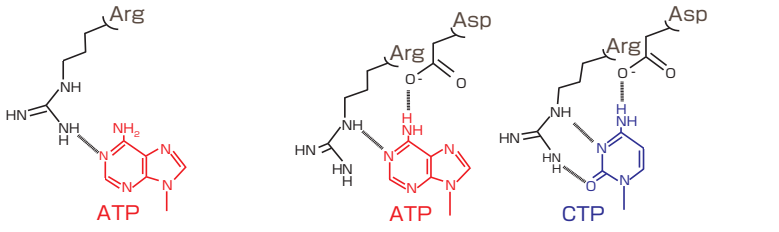
AIST TODAY Vol.11 No.10 p.16 (2011)



ATP recognition by polyA polymerase ATP/CTP recognition by CCA-adding enzyme

Nucleobase recognitions by polyA polymerase (left) and CCA-adding enzyme (right)