

SATREPS

Hydrogen in Uzbekistan



KYUSHU
UNIVERSITY

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**Uzbek-Japan Innovation Center
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Presentation Topics

今日の講義

1- Background of the Project

水素SATREPSプロジェクトは如何にして始まったか？

2- Project Concept

プロジェクトコンセプト

3- Technical Challenges

技術的挑戦

4- Expected Business Model

研究成果の社会実装戦略

Uzbekistan's Characteristic

ウズベキスタンの 特性

Ample Mineral Resources

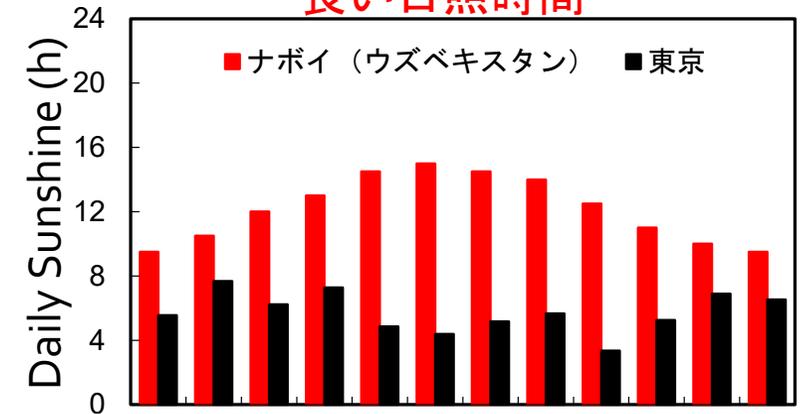
豊富な天然資源

2019

Minerals	Annual Prod. (t) (World ranking)
Uranium	3,500 (4)
Tungsten	300 (9)
Gold	102 (8)
Silver	260 (16)
Copper	141,000 (21)

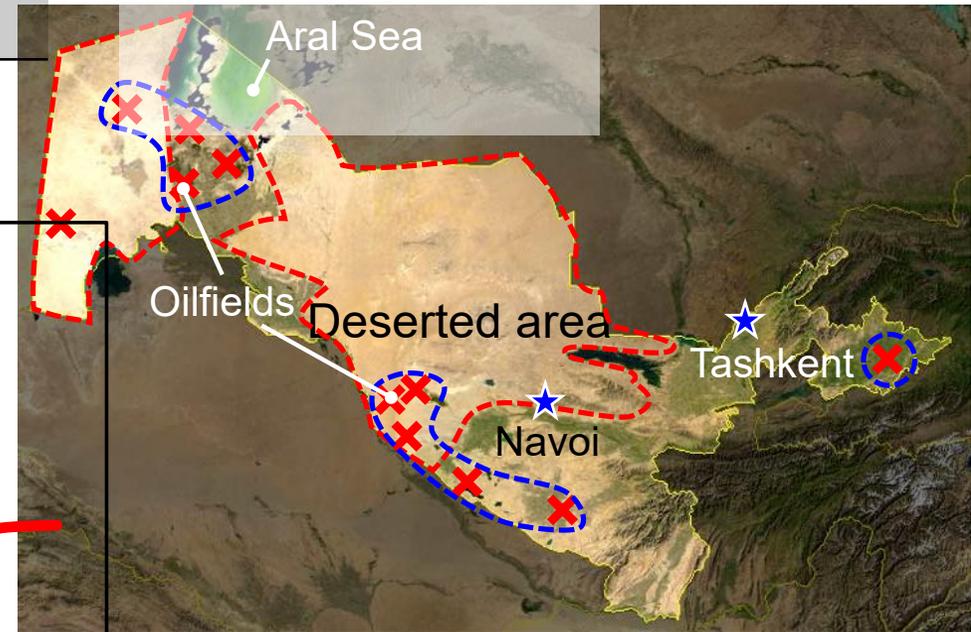
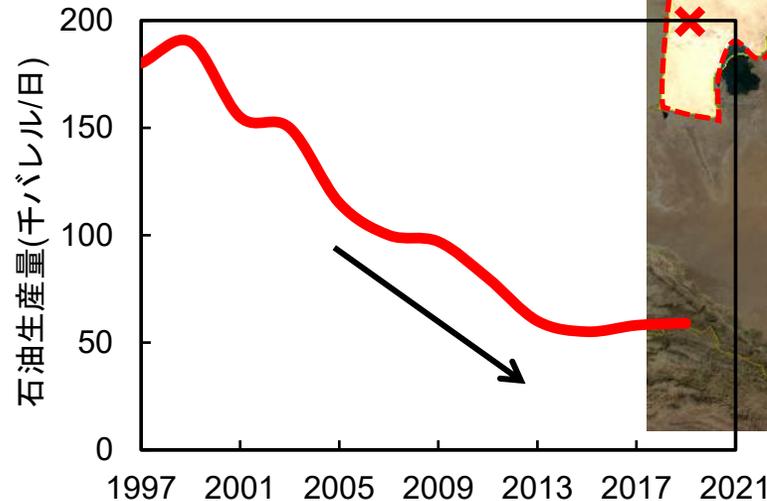
Abundant Solar Radiation

長い日照時間



Depletion of oil resources

石油資源の枯渇



Background - How the Project was Initiated ?

水素SATREPS
プロジェクトは如何
にして始まった
か？

1. National Hydrogen Strategy (2021)

"How to realize hydrogen society in Uzbekistan?"



2. Forming Research Partnership (2021-)



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International Institute of
Carbon-Neutral Energy
Research (Japan)



Navoi State University
of Mining and
Technologies



National Institute of
Renewable Energy
Resources



National University
of Uzbekistan

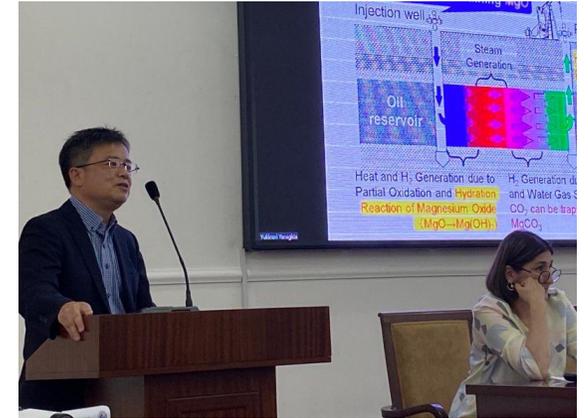
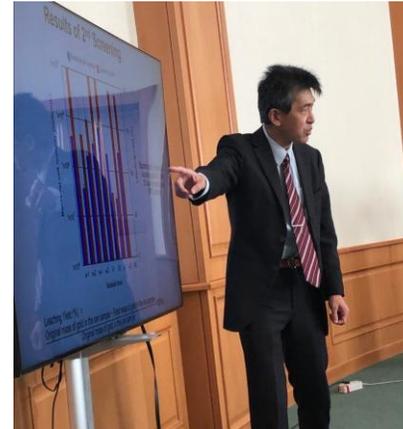
3. Pre-Research and Public Outreaching

Execution of Site Inspections and Seminars at Universities

現場視察とセミナー、シンポジウムの実施

Background -
How the
Project was
Initiated ?

水素SATREPS
プロジェクトは如何
にして始まった
か？



Background - How the Project was Initiated ?

水素SATREPS
プロジェクトは如何
にして始まった
か？

4. Successful Acquisition of Research Fund (SATREPS 2023) 研究資金の獲得

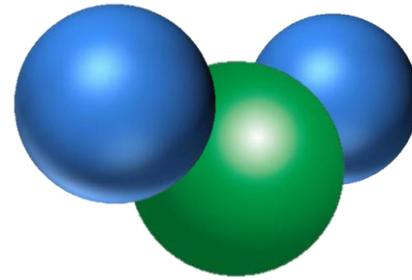


*Exchange of Minutes of Meeting between JST/JICA and UJICY in
September 2023*

Project Concept

プロジェクト
コンセプト

H₂Uz



SATREPS-Hydrogen

*of Uzbekistan,
for Uzbekistan,
by Uzbekistan*

Project Concept

プロジェクト
コンセプト



SATREPS-Hydrogen

Of Uzbekistan – *Study of edge-cutting technologies to generate hydrogen using resources of Uzbekistan* ウズベキスタンの特性を生かし、ウズベキスタンにある資源を利用した最新の水素製造技術の研究

For Uzbekistan – *Economy-technical recommendation for realization of hydrogen society in Uzbekistan* ウズベキスタンに水素社会を実現するための技術・経済提案

By Uzbekistan – *Development of young Uzbek human resources for leading hydrogen society by themselves* 自国で将来の水素社会を実現できるようにするための人材開発

Project Concept

プロジェクト
コンセプト

Utilization of Industrial Waste

産業廃棄物の活用

Depleted oil reservoir, Photocatalyst from slug and fly ash from metal factories

Limited Water Resource in Uzbekistan

限られた水資源への配慮

Technology to minimize usage of water in green hydrogen generation

Feasibility Study for Social Implementation

社会実装の為の経済性計算

Provide “reality” to Uzbekistan’s Hydrogen Strategy

Technical Challenges

技術的挑戦

Four Major Research Areas

4つの研究分野

1-Hydrogen Generation and CO₂ Storage at abandoned oil well 老朽化油田での地下原位置水素化技術

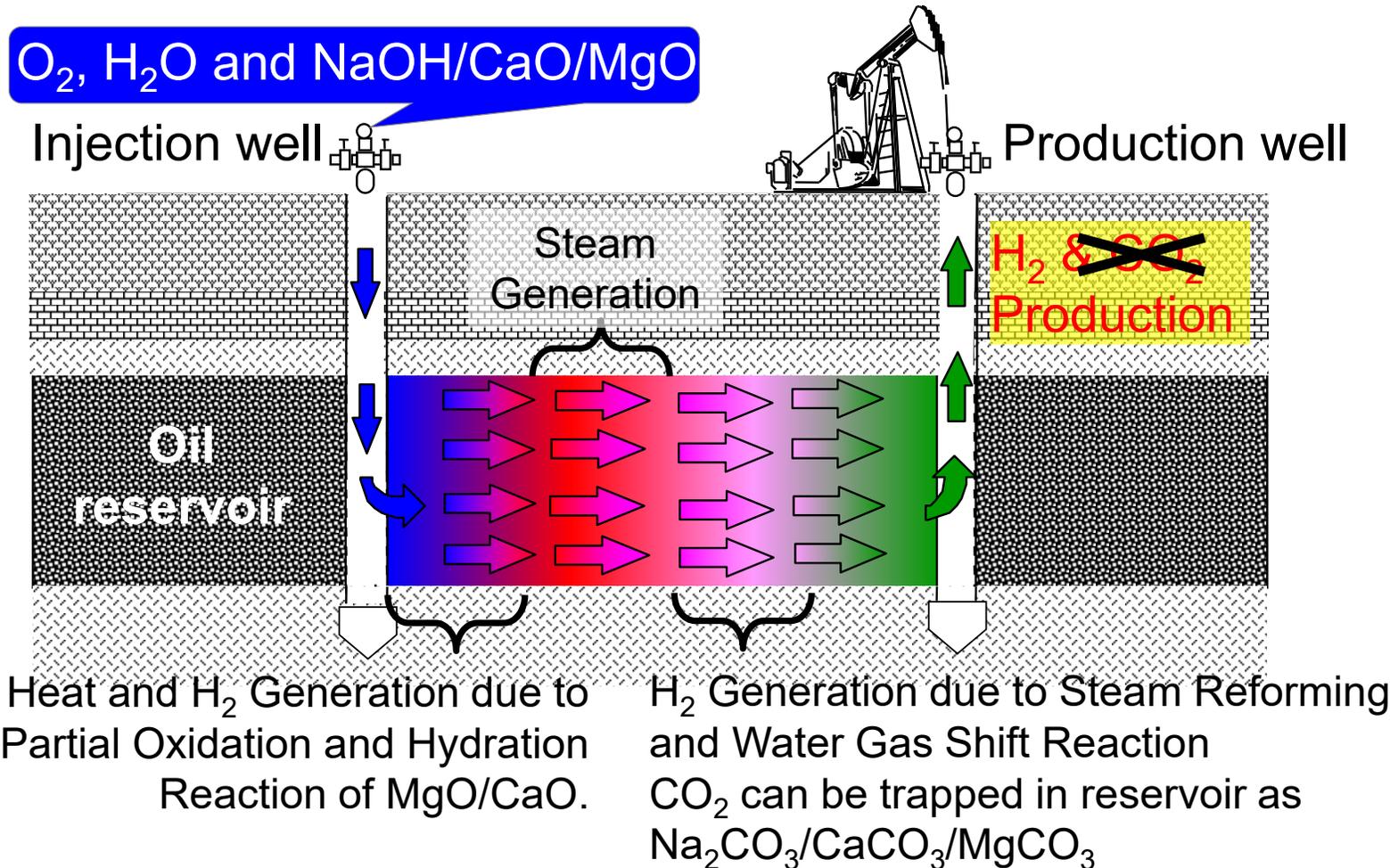
2-Steam Electrolytic Hydrogen Production using Proton Conducting Oxides 水蒸気電解技術

3-Development of Efficient and Durable Perovskite Solar Cell under Uzbekistan Environment
ペロブスカイト太陽電池の開発

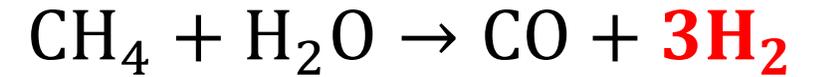
4-Photocatalytic H₂ production utilizing copper slug 鉱山廃棄物を利用した水素素生成光触媒複合体の開発

Underground in-situ hydrogenation technology for petroleum

~Next generation blue H₂ production that completes both H₂ production and CO₂ fixation in-situ underground~



H₂ production reaction by steam reforming of hydrocarbon (methane)



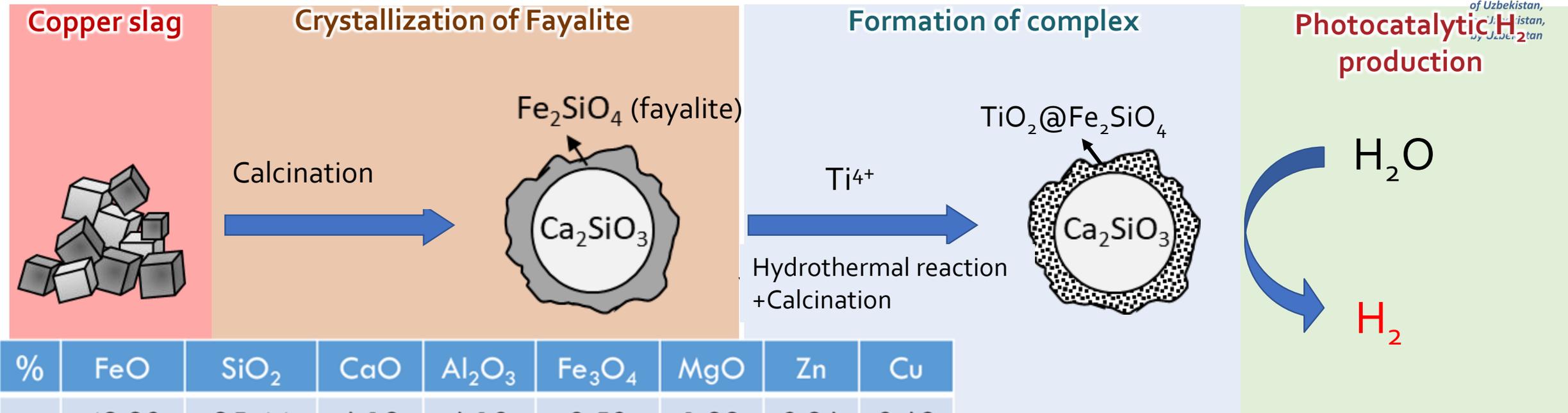
Water gas shift reaction



H₂ production due to thermal decomposition reaction of methane



Photocatalytic H₂ production utilizing copper slag



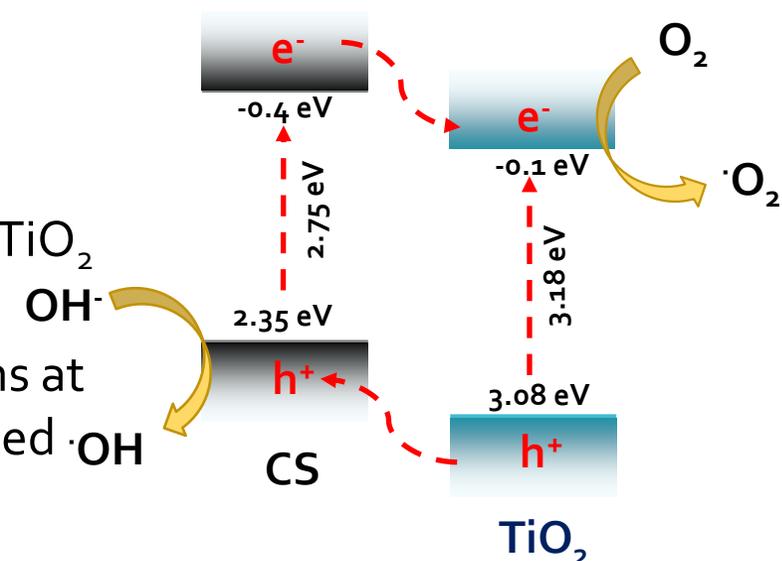
%	FeO	SiO ₂	CaO	Al ₂ O ₃	Fe ₃ O ₄	MgO	Zn	Cu
	43.90	35.44	6.19	6.12	2.50	1.33	0.96	0.69

Advantages of Copper Slag-derived Photocatalytic Composites

The main phase of Cu slag is visible light responsive fayalite (E_g~2.7 eV)

Fayalite serves as a template for TiO₂ crystals and prevents aggregation of TiO₂ particles

Under visible light irradiation, fayalite enables transport of excited electrons at the junction surface of fayalite and TiO₂, preventing recombination of excited ·OH electrons in TiO₂.



(Montoya-Bautista et al, 2021, Chuaicham et. al, 2020)

Exporting Japanese high-quality technologies and Utilization of JCM

Expected Business Models

研究成果の 社会実装戦略

Research	Example of Business Model	Related Industries
H₂ Generation and CO₂ Storage at abandoned oil wells	Joint Venture between Uzbek oil development companies and Japanese companies which have state-of-art technologies, with using Japan's leading JCM.	Oil & Gas Development, Engineering, Investors to Energy Resources
Development of Efficient and Durable Perovskite Solar Cell under Uzbekistan Environment	Development/Transition of Perovskite Solar Cell Market which is more efficient than existing Silicon PV which has been saturated in Uzbekistan. Joint venture with Uzbek Renewable PPP and Japanese technology providers.	Chemical, Electrical, Power Suppliers, Investors to Energy Sources
Steam Electrolytic H₂ Production using Proton Conducting Oxides	Joint venture with Uzbek Heat Producers which has ample waste heat which can be used for steam electrolysis. Generate value added hydrogen from waste heat.	Heavy Industry Engineering, Regional Heat Suppliers
Photocatalytic H₂ production utilizing copper slug	Joint venture with state-owned mining companies in Uzbekistan. Hydrogen can contribute to generate additional profit for the companies and investors.	Mining , Natural Resources, Chemical, Engineering, Investors to Natural Resources