Fiscal Year 2013, Tokyo Institute of Technology ASPIRE League Research Grant

Selected Research Projects in FY2013

Principal Researcher	Name	**Toshiaki KAMACHI**
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	Position	Associate Professor
Co-researchers	HKUST	―
	KAIST	―
	NTU	Wun Jern Ng, NEWRI, Division of Environmental & Water Resources Engineering, Professor & Executive Director
	Tsinghua	Chong Zhang, Institute of Biochemical Engineering, Assistant Professor
Subject of the research project		**Joint international research on biological hydrogen production**
Summary of the research project		Hydrogen gas is a promising future energy source because it is renewable, does not emit the "greenhouse gas" CO_2, liberates a large amount of energy per unit of weight during combustion, and is easily converted to electricity by fuel cells. However it is currently produced entirely through the reforming of fossil fuels. Therefore, H_2 currently is neither renewable nor carbon-neutral. So an alternative hydrogen production system is desired. Biological hydrogen production offers the possibility of generating H_2 that is renewable and carbon neutral. Biological hydrogen production can be achieved by photosynthesis or fermentation carried out by microorganisms, because microorganisms evolve hydrogen through metabolic processes, by the reduction of two protons (H^+) with electrons (e^-): $2H^+ + 2e^- \rightarrow H_2$. This reaction is catalyzed by the enzyme hydrogenase. In this research project, we investigate the construction of a

	biological hydrogen production system using hydrogenase. The project includes photosynthetic hydrogen production and fermentative hydrogen production. In the photosynthesis hydrogen production system, the electron transfer pathway from the photosynthetic membrane to hydrogenase is designed to optimize hydrogen production. In the fermentative hydrogen production system, the screening of microorganisms will be carried out to increase the yield of hydrogen gas.