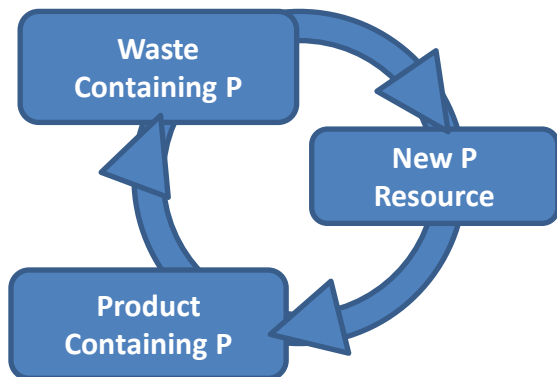


# Development of Phosphorus Resource and Catalyst Process Based on Chemical Engineering

Professor Shigeru Sugiyama



**Resource Circulation Map for Phosphorus**

(a) Circulation of phosphorus resource

LNG to Ethylene  
= Direct Employment of LNG  
for Petrochemical Plants

**Raw material for  
ethylene plant from LNG**



LPG to Various Chemicals  
= Development of Substituted  
Resources for Petroleum

**Production of raw  
material for MMA from  
LPG**



(b) Various chemicals from LNG and LPG

## Content:

Phosphorus is an essential element for plant growth and has no substitute in food production. Furthermore, it is used in various advanced materials. Phosphate rock as a raw material of phosphorus is finite and non-renewable. Therefore, the development of new raw materials for the rock is an urgent issue in Japan. In our group, search of new resource for the rock together with the development of the easy and economical recovery method of phosphorus from the resource is in progress.

As another topics, to prepare for the drying up of petroleum, the conversions of main products in liquefied natural gas (LNG) and liquefied petroleum gas (LPG) to various chemicals on solid catalysts are studied. Based on our earlier studies on the oxidative coupling of methane (LNG) on solid catalysts, the oxidation of C3- and C4-hydrocarbons (main components in LPG) are in progress. Recently, we have found out that oxidative dehydrogenation of isobutane (from LPG) on mesoporous silicas favorably produces isobutene, which is a raw material for methyl methacrylate (MMA); one of the most possible monomers obtained from petroleum.

Keywords : rare resources, solid catalysts

E-mail: sugiyama@tokushima-u.ac.jp

Tel. +81-88-656-7432

Fax: +81-88-656-7432>

HP :

<http://www.chem.tokushima-u.ac.jp/C3/>

