

## PROPOSAL OF COOPERATIVE STUDY TOWARD ESTABLISHING ASIACATALYST

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**Abstract** – Cooperative studies on "Reference Catalyst" in Japan have proven to be very important and useful not only for characterization of catalysts but also for standardization of characterization techniques. This recognition has motivated us to propose "Asiacatalyst", an extended version of Reference Catalyst, for similar cooperative activities in Asian countries.

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*Key words:* Reference Catalyst, Asiacatalyst, Al<sub>2</sub>O<sub>3</sub>, Zeolite

### HISTORY OF REFERENCE CATALYSTS

In 1969, Dr. H. Matsumoto, who was then a graduate student of the University of Tokyo and is now general manager of Reference Catalyst committee of the Catalysts Society of Japan, called for young people of the Society to carry out a cooperative study on a common (reference) catalyst. A commercial silica-alumina catalyst of the same origin and the same lot was distributed to people in universities and companies for measurements of its solid acidity by their own methods including Titration, UV, IR, TPD, OH measurement, ESR, compressed effect, cumene cracking, etc. In the first night of the summer school that followed, they had exciting discussion on the solid acidity of the silica-alumina catalyst, because the data on the same catalyst were so diversified and unique depending on the methods and procedures used. This was the first historical event, by which everyone from young to senior in the Society was obliged to learn what the solid acidity of silica alumina is and how it should be measured. In 1979, the Reference Catalyst committee was organized in the Catalysis Society of Japan.

Right now, more than 40 samples including Al<sub>2</sub>O<sub>3</sub>, TiO<sub>2</sub>, SiO<sub>2</sub>, zeolite, etc., are enlisted in Reference Catalyst. An important task of the Reference Catalysts committee is to distribute the samples to members of the Society on request, free of charge. This task has been done based on the volunteers activity. Another task is to collect the characterization and/or catalysis data obtained by the users of the samples. These data are extremely valuable, because subsequent users can know more details of the samples before they use. In other words, the software (data) is available to the users together with the hardware (catalyst). Compilation of the data and, if possible, production of a large database are therefore an important activity which provides a substantial help to

all researchers in the field of catalysis. We have two ways of collecting the data. In one way, each user who has published a research paper is requested to report it to the committee. The data of Reference Catalyst samples are then collected together occasionally and published as a data book. The 2<sup>nd</sup> edition of the book was printed in 1993, and it is still being sold. You can buy it from the office of the Society, but it is written in Japanese. In the near future, the 3rd edition, probably English, should be published. Another way is to hold a symposium on Reference Catalyst. Actually, a symposium has been organized, whenever new catalysts were distributed. In the symposium, the suppliers report the basic data of the new catalysis e.g., components, impurities, surface areas, etc., whereas the users present the characterization and/or catalysis data which are so familiar and easy to measure for them. These data are indispensable information of the new catalysts.

As an important consequence, such cooperative activities on Reference catalyst have contributed to the standardization of characterization techniques [Murakami, 1983; Niwa et al., 1986]. Because everybody uses exactly the same catalysts, it is so easy to compare his own data with others. It can be called "a contest of characterization". This has led to leveling-up characterization techniques as well as to establishing a fundamental basis for characterization. To data, we have standardized experimental procedures for at least three characterization methods, i.e., BET surface area, CO adsorption on metals, and TPD of ammonia on zeolites. People can rely on the standardized procedures for their own works. Recently we are extending our cooperative studies to the standardization of preparation methods for supported metal oxide catalysts such as MoO<sub>3</sub>/Al<sub>2</sub>O<sub>3</sub>, V<sub>2</sub>O<sub>5</sub>/TiO<sub>2</sub> and CoO/Al<sub>2</sub>O<sub>3</sub>. This project, led by Prof. T. Uchijima of Tsukuba University, has been supported by the Grand-in-Aid of Mombusho (Ministry of Education, Science, Sports and Culture, Japan) in 1995-97. Interesting information on the key steps of catalyst preparation, such as that the structure and activity of MoO<sub>3</sub>/Al<sub>2</sub>O<sub>3</sub> catalyst are affected most of all by the drying process, is being collected, as summarized in scientific reports [Satsuma et al.,

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**Table 1. List of asiacatalyst**

Sample	Code	Supplier
Alumina	JRC-ALO-1	Sumitomo Chem.
	JRC-ALO-2	C.C.I.
	JRC-ALO-5	Mizusawa Chem.
	JRC-ALO-6	Nikki Universal
	JRC-ALO-7	Nikki Universal
Zeolite*	JRC-Z-Y5.5	Tosoh
	JRC-Z-Y5.3	C.C.I.
	JRC-Z-HY5.5	Tosoh
	JRC-Z-HY5.3	C.C.I.
	JRC-Z-M15(1)	Tosoh
	JRC-Z-M20(1)	Tosoh
	JRC-Z-HM20(4)	Tosoh

\*Abbreviations used; Y for Y zeolite and M for mordenite. The figures at the end of the codes show approximate  $\text{SiO}_2/\text{Al}_2\text{O}_3$  ratios. For more details, see Report of Reference Catalyst Committee, Shokubai, 39, No. 3, Announcement, 6 (1997).

1996; Okamoto et al.].

With almost no funds being available, all the activity of Reference Catalyst has been carried out by volunteers in companies and universities. Industrial companies in Japan have donated their catalysts, while key laboratories in universities volunteered to distribute the catalyst samples to local members. However, problems appear as time goes by. Some of the samples including the most important alumina (JRC-ALO-4) and mordenite zeolites have been sold out, whereas the supplier companies ceased production. In addition, some key laboratories became unable to cooperate due to changes in situation. To overcome these problems, we have changed some of our policies. First, we decided to disclose the names of supplier companies and asked them to keep sufficient amounts of stocks to supply for a long time. Second, we changed the way of distribution for newly supplied catalyst samples such as alumina, zeolite, and MgO. We asked a few persons to be a mediator between the companies and users; upon request from users, they ask the companies to send the samples to the users. These are important alterations to secure the continuation of the activity.

### PROPOSAL OF ASIACATALYST

From recognition of the significance of such cooperative activity on Reference Catalyst, we have proposed to set forth a similar scheme in Asia, named "Asiacatalyst". Our proposal has been receiving good responses from Asian countries. Through cooperative studies using exactly the same catalysts, people in Asian countries can communicate with each other and deepen mutual understanding internationally. At the same time, this would contribute significantly to the progress of catalytic sciences and technology. We want people of Asian countries to understand the policy of activity; *we are not only*

*a catalyst receiver but also a data server.* This is a fundamental basis of the voluntary activity.

Several kinds of alumina and zeolite samples have been enrolled in Asiacatalyst as shown in Table 1. Some samples are identical with those enrolled in Reference Catalyst, but many others are new faces. These samples have already been transferred to Prof. G. Seo (Korea), Prof. S. Cheng (Taiwan), and Prof. S. Phatanasri (Thailand), who have kindly accepted our request to take a role of distribution center in each country. These centers will distribute the samples to local members upon request, 200 g of each. We will enroll other catalysts such as titania and silica as soon as the distribution network for them is organized.

The aim and scope of Asiacatalyst are almost the same as those of Reference Catalyst, as follows.

- (1) Promotion of cooperative studies using Asiacatalyst samples. This will catalyze another cooperative activity among Asian countries.
- (2) Compilation of the characterization and catalysis data for Asiacatalyst toward publication of a data book. Each user is requested to report it to the distribution center when his study has been published.
- (3) International symposia specified to Asiacatalyst will be organized hopefully in the near future.

The activity of Asiacatalyst is backed up by the Reference catalyst committee and in addition it is supported by Grant-in-Aid of Mombusho (representative, the present author) for 1997-1998. We extend cordial invitation to those who are interested in Asiacatalyst to join us to carry out cooperative studies. We hope that such cooperative activity will be of substantial benefit to the catalysis community in Asia.

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