Comments on the Meeting Documents

The prepared documents for this meeting "Review of scientific information on lead", "Review of scientific information on cadmium" and Appendixes (revised draft of 18 August 2006) have comprehensively reflected the works such as the transport of lead and cadmium in environment, and the pollutions to the environment and the pollution controls up to now. In addition to submitting the data "The headway on Controlling the Environmental Pollutions of Lead and Cadmium in China" for reference to revision and supplement of the meeting documents, we also hope that the following contents shall be included in the meeting documents according to the actual cases on the controls to environmental pollutions of lead and cadmium in China:

1 The specific suggestions on how to strengthen the international cooperation to commence the farther research on lead and cadmium long-range transport in environment (at present, China has not commenced such research work yet).

2 How to promote the developed countries to provide or transfer the technologies on eliminating the existing pollutions to the developing countries, especially the technologies in eliminating the pollutions of the soil containing high lead and cadmium and the pollutions of the sludge on the bed of rivers surrounding the lead and

zinc smelters, so as to prevent the secondary pollutions in the stacked waste slag.

In addition, the “lead”should be changed to“cadmium”appeared in the eleventh line of paragraph 533 in the document “Review of scientific information on cadmium” in my opinion.

The headway on Controlling the Environmental Pollution of Lead and Cadmium in China

(Zong zijiu, China)

1 Overview

China is one of the leading countries producing lead and zinc, its annual production of lead was up to 2,378,000 t and zinc around 2,711,000 t in the year 2005. The main cadmium production is to recover from slag of various zinc smelters. There are 411 enterprises involved in lead-zinc mining and dressing and 466 enterprises involved in lead-zinc smelting with certain production capacity (whose annual production value exceeding RMB 5,000,000 Yuan) around the country. The largest application field of lead consumption is the production of lead acid batteries in China as in other countries.

2 The Primary Environmental Issues At Present

China nonferrous metal industry has gained flying progresses in smelting processes, technical facilities and environmental protection in the recent 20 years. However，lead smelting industry is equipped with the slowest technical facilities and the worst operating conditions, and gained the lowest sulfur recovery, and produced the most severe pollutions amongst China nonferrous metal industry. The main environmental issues at present are as following:

（1）There are still some 30% of the lead smelting capacity is in the operation adopting backward processes, among which the sintering circuit produces SO_2 gas and lead dust that is not recycled to reuse, thus causes serious operating conditions, and the SO_2 and lead dust emit into the atmosphere to pollute the environment severely.

（2）Waste water from some small capacity lead-zinc smelteries is directly discharged without any treatment, which lead to the pollution of surface water and ground water caused by the harmful heavy metal ion such as lead and cadmium etc.

（3）The number of lead-zinc smelteries of medium and small capacity is superabundant, for example, some small smelteries of annual output less than 2000t don't even recover other valuable metals, which results in huge waste of resources, furthermore, their environmental pollution can not be controlled both economically and reasonably.

From the survey of the quality of environments surrounding some lead and zinc production enterprises, the pollution of lead and cadmium is within the scope of several square kilometers or tens of square kilometers. For instance, the waste water of a large lead-zinc smeltery first is discharged into a creek, and joins into the Xiangjiang River later on. The lead concentration of the river water near the waste water discharge site is 0.105mg/L, and cadmium concentration is 0.097mg/L, but after a distance of around 1000m the lead concentration becomes 0.0089mg/L,

cadmium concentration becomes 0.00389mg/L, such water quality is qualified basically according to the requirements of relevant standards. However, the lead content of the sediment(sludge) on the bed of the creeks is 690.3 mg/kg, and the cadmium content is 167.58 mg/kg, which indicates that the concentration of lead and cadmium is rather obviously cumulated in sediment of river.

3 Chinese government's actions on the control and reduction of lead and cadmium pollutions

3.1 Adjustment of industrial structure

The Chinese government is making its best efforts to control the blind increases of lead-zinc smelting capacity based on the principle of structural optimization, technical progressing, scientifically planning, reducing consumption and saving energy and environmental protection. The effective measures adopted include promoting the outstanding enterprises whilst discarding inferior enterprises, and advancing the reconstruction of the predominant and superior metallurgical smelteries and mines, ensuring the output of predominant smelting corporations to achieve over 70% of the total output.

The Chinese government requires that all the lead-zinc enterprises to achieve the goals of high resource recovery and lower energy consumption and environmentally friendly by adopting the reinforced smelting processes with rich oxygen, and also requires the off-gas

produced from such enterprises to be transferred to acid by adopting the advanced acid producing system featuring double stages of transferring and double stages of adsorption by the year 2010 after washing out the enterprises with backward production capacity.

3.2 Market admittance qualifications of new lead smelting enterprises

The Chinese government is now making new market admittance qualifications for newly-established lead smelting enterprises, any project with nonconformity is not allowed to start construction. Specific qualifications are as following:

For the newly-established lead smelting projects, their single system production capacity must achieve over 50,000t annually (excluding 50,000t annually), the leading processes such as higher content of oxygen air blowing from top or bottom of the melting pool of the furnace or the Carldo furnace, and the integrated energy consumption for lead smelting must be less than 600kg (standard coal)/ton (product), and the total lead recovery must be up to 97%, whilst the sulfur utilization rate must be greater than 95%, and the recycling rate of water must be up to 95%, and the dust and SO_2 must be emitted meeting the emission standard, and recover of other valuable metals must be up to 95%.

For the newly constructed projects of regenerative lead, their capacity must be over 10000 tons annually.

3.3 Eliminating backward capacity within limited period

The Chinese government has already made the schedule to wash out backward lead smelting capacity, where processes and facilities causing environmental pollutions seriously will be eliminated in mandatory ways. Specific requirements are as following:

By the year 2005, the backward processes and facilities for lead smelting such as sintering pots, and sintering plates, and simplified blast furnaces, and the regenerating lead process by melting in crucible pot furnace etc must be eliminated.

By the end of the year 2008, the processes that are environmentally unqualified or unmatched acid manufacture and off-gas adsorption systems applied to the sintering devices must be eliminated.

3.4 Environmental impact assessment system and “mandatory synchronization” mechanism

China has commenced to carry out its environmental impact evaluation system on construction projects since the early 1980s, and formally issued the <Environmental Impact assessment Act of People’s Republic of China> in the year 2003.

An environmental impact assessment must be carried out prior to the commencement of a newly-established or reconstructed project involved in lead smelting or mining. For the projects of which the pollutant discharge fails to meet the relevant standards, or the construction area does not have sufficient environment capability, or without permission of

local residents will not be approved by the directing department on environmental protection.

The Environmental Protection Act of PRC also specified the "Mandatory Synchronization" mechanism, namely the environmental protection facilities of the project must be "designed simultaneously, constructed simultaneously and put into production simultaneously" with those of the main project.

3.5 The penalty system on environmental pollution

The Chinese government has already made and carried out the pollution charge system, and charge for the corporations according to the types and quantity of the discharge pollutants. The charge, in turn is used to the pollution control and improvement of local environment quality.

The Chinese government will immediately shutdown the lead smelting corporations if they cause environmental pollution accident, and requires such enterprises to take effective measures to control the pollution within a limitation of time. Taking the Shaoguan smeltery as an example, which produced about 80,000t lead and 180,000t zinc in the year 2005, but it was forced to shutdown by the national governing department of environmental protection because of the river pollution resulted from over-discharged wastewater which contained cadmium during the inspection period in December 2005. Another lead smeltery located in Henan province, China was also forced to shutdown because it

discharged leaded pollutants which resulted in the lead contents in urine and blood of children exceeding the criteria in the nearby villages.

3.6 Leaded gasoline for vehicles has been phased out in China.

4 Applications of advanced lead processes in China

China has formally issued the <Cleaner Production Promotion Law of PRC> in the year 2003, which has considerably promoted the development and applications of clean production processes.

The China ENFI Engineering Corporation is the top corporation with the most powerful strength involved in engineering, consulting and contracting business in the Chinese non-ferrous metal industry, and the lead smelting firms accounting for over 70% of the total capacity are designed by China ENFI Engineering Corporation.

The China ENFI Engineering Corporation has also independently successfully developed the SKS lead smelting process, where the horizontal turning furnace is adopted to implement the oxidization and desulfuration and smelting to the lead sulfide concentrates, replacing the sintering circuit which produces lead dust and SO_2 pollutions to the environment and the employee health. The outstanding features of the SKS process are: some facilities and equipment of traditional lead smelting process can also be used in SKS process thus the investment costs for reconstruction of such traditional lead smelters can be saved. The SKS process has now been successfully applied to several newly

constructed or reconstructed projects in lead smelting.

The China ENFI Engineering Corporation has also successfully applied the Isasmelt process to the newly constructed lead smelter named Yunnan Qujing Lead Smeltery (annual capacity 100,000 ton lead).

The application of clean production technology has facilitated efficiently reducing the environmental pollution from lead smeltery from the headstream.

5 China National Standard Related to the Control of Lead, Cadmium Pollutions

5.1 Standard of Environmental Quality

5.1.1 Drinking water（Maximum allowable concentration）：quote from <Standard for drinking water quality>GB5749-2006

Lead ≤0.01mg/L Cadmium ≤0.005mg/L

5.1.2 Surface water（limiting value）：quote from<Environmental quality standard for surface water>GB3838-2002：

categories of surface water	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅴ
Lead ≤mg/L	0.01	0.01	0.05	0.05	0.1
cadmium ≤mg/L	0.001	0.005	0.005	0.005	0.01

Category I is primarily applicable to the headstream water and the national natural protected areas.

Category II is primarily applicable to the first grade protected areas concentrative drinking water sources and precious fish protected areas and fish and shrimp spawning sites etc.

Category III is primarily applicable to the second grade protected areas concentrative drinking water sources and general fish protected areas and swimming areas etc.

Category IV is primarily applicable to the general industrial use water areas and water entertainment areas without human body contact.

Category V is primarily applicable to the agricultural water use areas and ordinary sight waters.

5.1.3 Ground Water ： quote from< Quality standard for ground water>GB/T14848-1993

Categories of Ground Water	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅴ
Lead ≤mg/L	0.005	0.01	0.05	0.1	>0.1
Cadmium ≤mg/L	0.0001	0.001	0.01	0.01	>0.01

Category I is primarily reflects the background low contents of the nature chemical components of the groundwater.

Category II is primarily reflects the background contents of the nature chemical components of the groundwater.It is applicable to various purposes.

Category III is based on the benchmark value of the human health. It is primarily applicable to the concentrative drinking water sources and industrial and agricultural use water.

Category IV is based on the industrial and agricultural use water requirements. It is primarily applicable to the industrial use water and partial agricultural use water. After it is properly processed, it is applicable to the drinking water.

Category V is not applicable to the drinking water. The selection of such category of water depends on other purposes.

5.1.4 Sea Water：quote from <Sea water quality standard>GB3097-1997

Categories of Sea Water		I	II	III	IV
Lead	≤mg/L	0.001	0.005	0.010	0.050
Cadmium	≤mg/L	0.001	0.005	0.010	0.010

Category I is applicable to the ocean fishery waters, and the sea nature protected areas and the protected areas for ocean life that are valued and being in severe danger.

Category II is applicable to the aquiculture areas, and bathing beach areas, as well as the entertainment and sea sporting areas with human body contacts, and the industrial use water areas for ocean life directly related to human foods.

Category III is applicable to the ordinary industrial use water areas, and the coastal beauty spot regions.

Category IV is applicable to the ocean harbor water areas, and the ocean development zone for operations.

5.1.5 Farmland irrigation water（limiting value）: quote from<《Standard for irrigation water quality》GB5084-92

Lead ≤0.1mg/L Cadmium ≤0.005mg/L

5.1.6 Ambient air（limiting value）: quote from<Ambient air quality standard>GB3095-1996

Lead ≤0.0015mg/Nm^3 （Quarterly Average），≤0.0010mg/Nm^3 （Annually Average）

5.1.7 Soil: quote from<Environment Quality Standard for Soils>GB15618-1995

Standard Level	Level 1	Level 2			Level 3
pH Value of Soil	Nature Background	<6.5	6.5-7.5	>7.5	>6.5
Lead ≤mg/kg	35	250	300	350	500
Cadmium ≤mg/kg	0.20	0.30	0.30	0.60	1.0

Level 1 Standard is the limit value of the soil environment quality that must be maintained in nature background for the nature ecosystem of the protected areas.

Level 2 Standard is the limit value of the soil that must be maintained to ensure the agricultural production and maintain the human health.

Level 3 Standard is the critical value of the soil that must be maintained to ensure the agricultural and forest production and maintain the plant normal growth.

5.1.8 Foods: quote from<Maximum levels of contaminants in foods>GB2762-2005

Indexes of Limited Lead Contents in Foods :

Categories of Foods	Maximum levels（MLs）/(mg/kg)
Cereal	0.2
Legume	0.2
Potato	0.2
Meat of Birds and Livestock	0.2
Edible Offal and Organs of Birds and Livestock	0.5
Fish	0.5
Fruit	0.1
Fruitlet, Berry, Grape	0.2
Vegetable (Corm, foliate vegetable, edible fungus excluded)	0.1

Corm Vegetable	0.3
Foliate vegetable	0.3
Fresh Milk	0.05
Formula Milk	0.02
Fresh Egg	0.2
Fruit Wine	0.2
Juice	0.05
Tea	5

Indexes of Limited Cadmium Contents in Foods:

Categories of Foods	Maximum levels（MLs）/(mg/kg)
Rice and Soy	0.2
Peanut	0.5
Flour	0.1
Mixed Grains Other Than Rice (Corn, millet, jowar, potato)	0.1
Meat of Birds and Livestock	0.1
Liver of Birds and Livestock	0.5
Kidney of Birds and Livestock	1.0
Fruit	0.05
Rootstock vegetable (celery excluded)	0.1
Foliate vegetable, celery, edible fungus	0.2
Other vegetable	0.05
Fish	0.1
Fresh egg	0.05

5.2 Standard of Pollutant Emission(or discharge)

5.2.1 Air point sources(Maximum allowable emission concentration)：quote from<Emission standard of air pollutants for industrial kiln and furnace>GB9078-1996 and <Integrated emission standard of air pollutants>GB16297-1996

Categories of Areas		I	II	III
Lead ≤mg/Nm^3	Metal smelting	Prohibited	10	35
	Other sources	Prohibited	0.7	0.7
Cadmium ≤mg/Nm^3	All sources	Prohibited	0.85	0.85

Category I indicates the nature protected areas, and the beauty spot areas, as well as other areas that need special protection.

Category II indicates the town planning resident areas, and the mixed areas for resident and business purposes, as well as culture areas, and ordinary industrial zones and rural areas.

Category □ indicates the specifically designated industrial zones.

5.2.2 Wastewater (Maximum allowable discharge concentration) ： quote from<Integrated wastewater discharges standard>GB8978-1996

Lead ≤1.0mg/L Cadmium ≤0.1mg/L

5.3 Handling of solid waste

China has formally issued and implemented a series of national standards for solid waste handling.

Lead and cadmium containing solid waste should be identified according to the <Identification Standard for Hazardous Wastes—Identification for Extraction Procedure Toxicity> GB5085.3-1996. The wastes shall be hazardous wastes which is featured by leaching toxicity if the lead content in the lixivium ≥3 mg/L, or cadmium≥0.3 mg/L. Hazardous wastes must be disposed in accordance with the requirements stated in the <Standard of Pollution Control on Hazardous Waste Storage> GB18597-2001, or the <Standard for Pollution Control on the Security Landfill Site for Hazardous Wastes> GB18598-2001.

The specific requirements are as following(but not be limited to):

The treatment field boundary should be located in the place which is

800m away from the residential area and 150m away from the surface water area. The field foundation must be protected from seeping, and the seep-proof layer must be claypan of at least 1 meter thickness (the osmosis coefficient $\leq 10^{-7}$cm/s); or seep-proof layer (the osmosis coefficient $\leq 10^{-10}$cm/s～10^{-12}cm/s) made of high density polythene and artificial materials etc.

5.4 Regulation on occupational exposures to lead and cadmium in the workplace: quote from<Occupational exposure limit for hazardous agents in the workplace>GBZ 2-2002

5.4.1 Lead and inorganic compounds,as Pb

Maximum allowable concentration :

Lead dust $\leq 0.05 mg/Nm^3$

Lead fume $\leq 0.03 mg/Nm^3$

5.4.2 Cadmium and compounds,as Cd

Permissible concentration-Time weighted Average(8h/d): $\leq 0.01 mg/Nm^3$

Permissible concentration-short term exposure limit(less than 15 minutes): $\leq 0.02 mg/Nm^3$

6 The background value of lead and cadmium in soils

Lead in soils (China)

ID	Country	Soil type	Description（from reference）	In this study Categorized as	mg Pb/kg				Reference
					min	max	mean	median	
	China	Rice soil	The cultivated land dispersed in China is not in equilibrium. On the south side of the Qinling Mountain to the Huaihe river , rice soil is dominant; and on the the north side, dry farmland soil is in majority.	The background value of the cultivated soils. (uncontaminated rural soils)	16.5	56.0	-	-	The atlas of soil environmental background value in the people's republic of China,1994
	China	Damp soil			13.5	23.9	-	-	
	China	Drill soil			13.5	23.9	-	-	
	China	Floss soil			18.5	23.9	-	-	
	China	Black loamy soil			18.5	23.9	-	-	
	China	Oasis soil			23.9	31.1	-	-	

Cadmium in soils (China)

ID	Country	Soil type	Description（from reference）	In this study Categorized as	mg Pb/kg				Reference
					min	max	mean	median	
	China	Rice soil	The cultivated land dispersed in China is not in equilibrium. On the south side of the Qinling Mountain to the Huaihe river , rice soil is dominant; and on the the north side, dry farmland soil is in majority.	The background value of the cultivated soils. (uncontaminated rural soils)	0.024	0.029	-	-	The atlas of soil environmental background value in the people's republic of China,1994
	China	Damp soil			0.046	0.190	-	-	
	China	Drill soil			0.046	0.120	-	-	
	China	Floss soil			0.046	0.190	-	-	
	China	Black loamy soil			0.080	0.190	-	-	
	China	Oasis soil			0.024	0.190	-	-	