



惠城科技
HCpect



Comprehensive Re-utilization of Particle Pollutants from FCC Unit

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Content

- 1. Introduction of particle pollutants from FCC Unit**
- 2. Forming reason of particle pollutants from FCC Unit**
- 3. Classify of particle pollutants from FCC Unit**
- 4. Different solid waste treatment technologies of particle pollutants from FCC Unit**

1. Introduction of particle pollutants from FCC Unit



The fluid catalytic cracking unit could use about **1.2 million tons** of catalytic cracking catalyst all over the world. In the process of production will produce more than **1 million** tons of spent catalyst. Most of the spent catalyst will be buried for no use value.

Hazard of particle pollution from FCC Unit

The particle in air can cause haze and other air pollution.



The heavy metal cause serious pollution to the groundwater and soil.

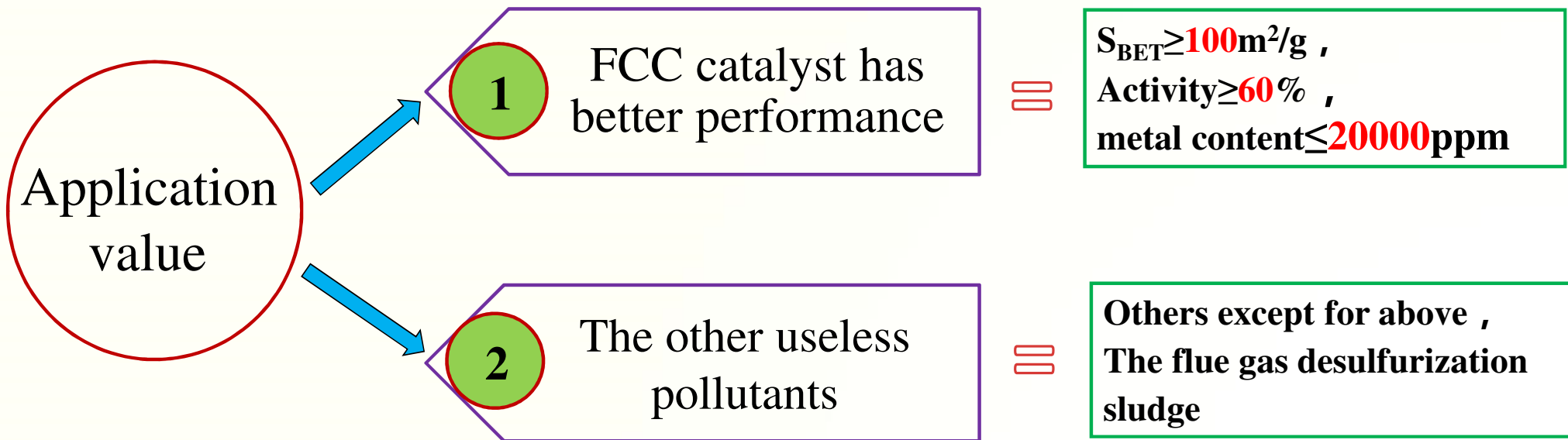


**All this is a waste of natural resource.
We need to make the fullest use of these resources.**

2. Forming reason of particle pollutants from FCC Unit

- 1、High temprature or steam in high temprature
- 2、Coking
- 3、Metal poisoning
- 4、Mechanical friction

3. Classify of particle pollutants from FCC Unit

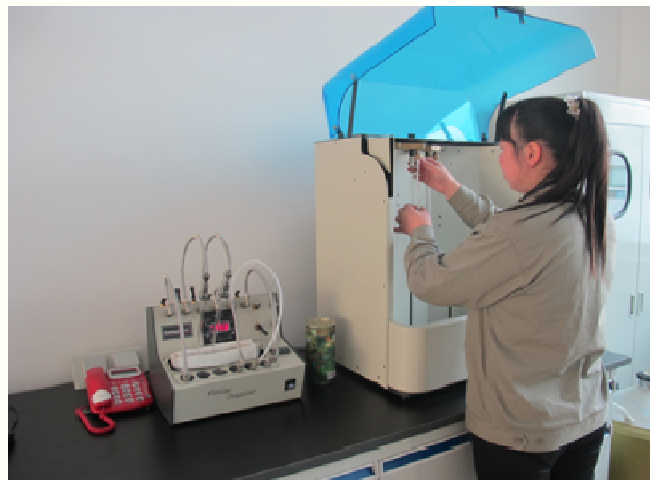


3. Classify of particle pollutants from FCC Unit

How?

Analysis and
determination platform

S_{BET}



Activity

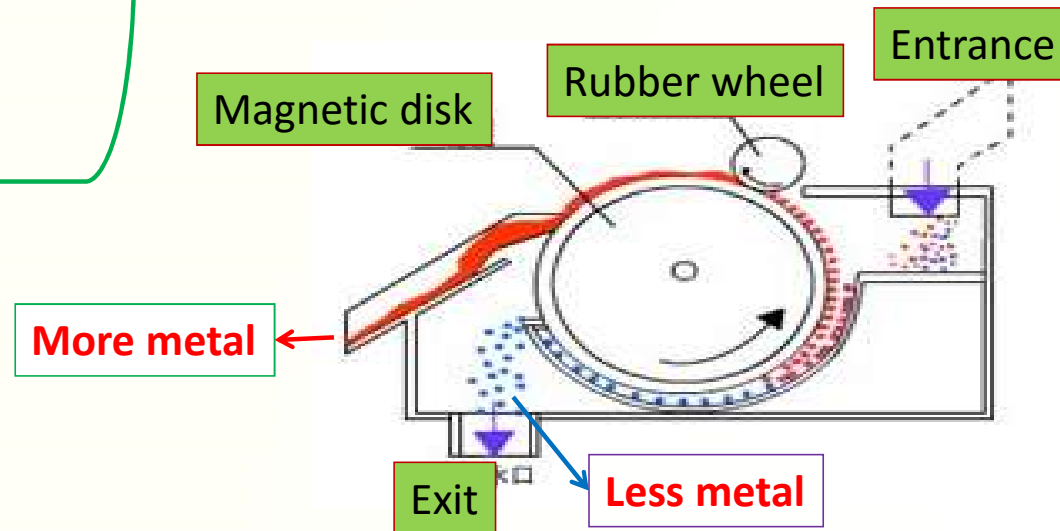


3. Classify of particle pollutants from FCC Unit

How?

Magnetic separation

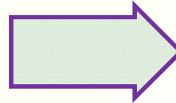
- Some metals (like Fe、 Ni) has magnetism
- More metals, larger magnetism
- Particle pollutants with metal contents $\geq 20000\text{ppm}$ could be separated in some voltage



4. Different solid waste treatment technologies of particle pollutants from FCC Unit

1

**FCC equilibrium
catalyst rejuvenation
technology**



FCC catalyst has better performance

2

**Elements separation
technology**



The other useless pollutants

FCC equilibrium catalyst rejuvenation technology

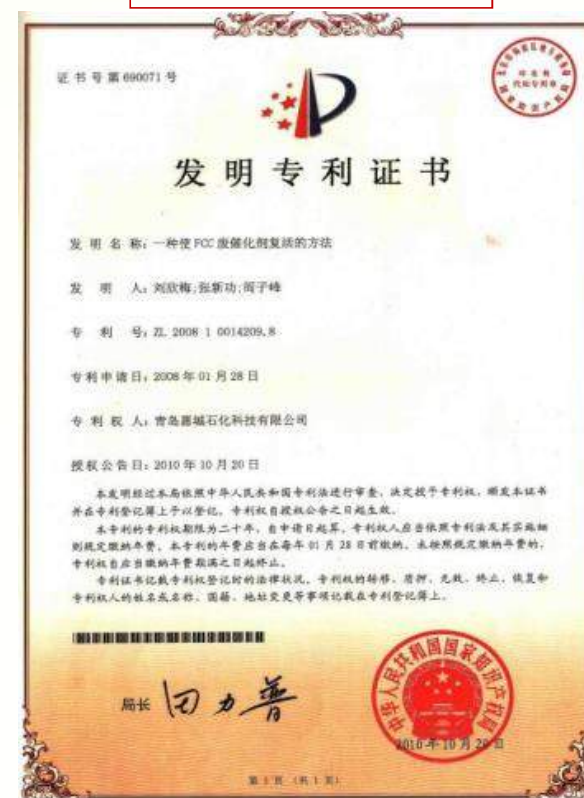
Invention patent

Method ➡ organic and inorganic coupling

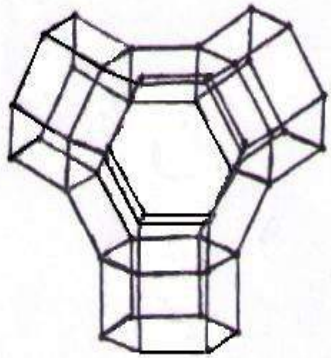
Properties of product ➡ Lower cost
Specific selectivity

High activity

Industrial application ➡ 2009 in China



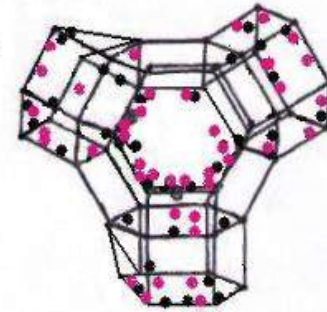
FCC equilibrium catalyst rejuvenation technology



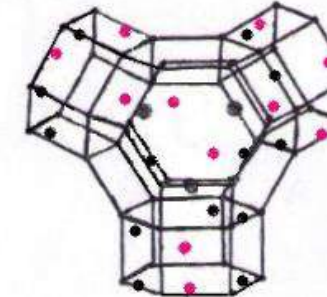
Fresh catalyst



Deactivated catalyst

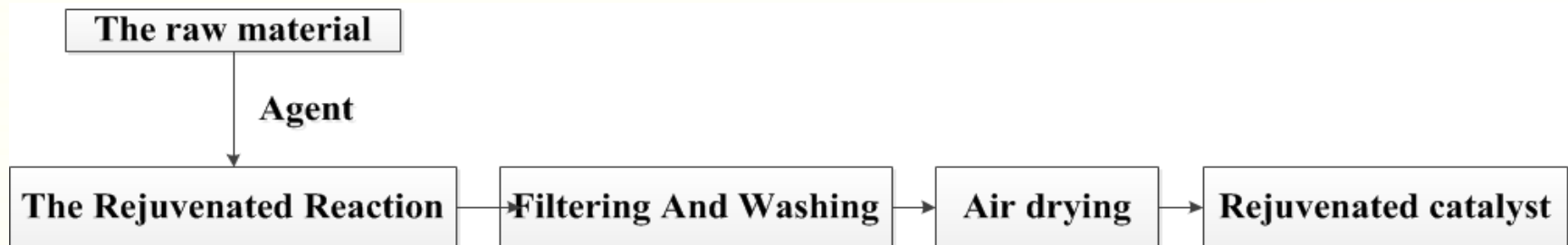


Regenerated catalyst



Rejuvenated catalyst

Principle of rejuvenation



FCC equilibrium catalyst rejuvenation technology

The comparison of catalyst properties before and after rejuvenation

Item		Before	After
Surface area(m ² /g)		92	173
Micro Activity % (m/m)		66	78
Pore size (ml/g)		0.14	0.23
Metal	Fe(m%)	0.53	0.35
	Ni(m%)	0.59	0.63
	V(m%)	0.02	0.02
	Na(m%)	0.30	0.21
Attrition	0-20 (μm)	1.32	0.61
	20-40 (μm)	7.89	7.63
	40-60 (μm)	24.87	24.11
	60-80 (μm)	25.66	24.72
	>110 (μm)	15.36	18.69

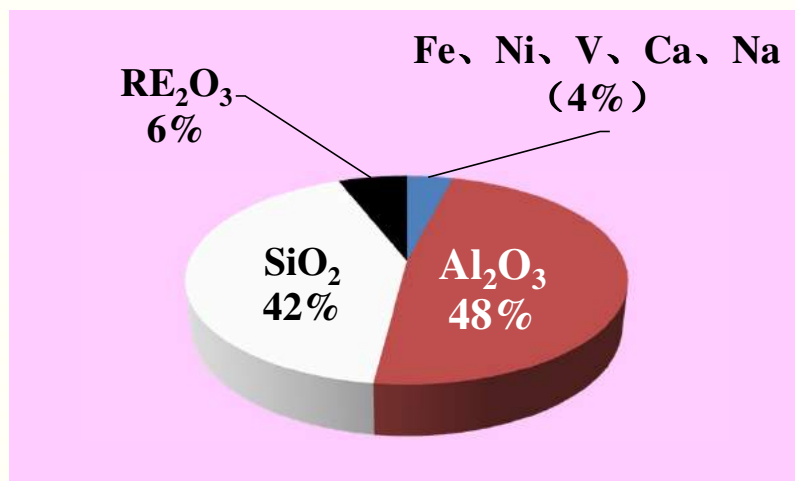
FCC equilibrium catalyst rejuvenation technology

Industrial
application
calibration
data

item	Before trail 2007.9.8- 2007.9.18	With 15% rejuvenated catalyst 2008.1.1- 2008.1.8	difference	Same time last year
				Jan. 2007
Catalyst	BASE	BASE 85%+ rejuvenated 15%		BASE
Processing capacity ton/day	4207	4196	-11	4093
Residue blending ratio %	57.86	58.01	0.15	60.4
Dry gas	4.16	4.07	-0.09	4.01
LPG	17.41	16.69	-0.72	16.78
gasoline	35.51	36.09	0.58	36.81
Light diesel	24.19	24.42	0.23	23.92
Heavy diesel	4.82	4.77	-0.05	4.39
slurry	4.29	4.36	0.07	4.37
coke	9.14	9.12	-0.02	9.24
loss	0.48	0.48	0	0.49
Gasoline + light diesel	59.7	60.51	0.81	60.73
LPG + gasoline + light diesel	77.11	77.2	0.09	77.51

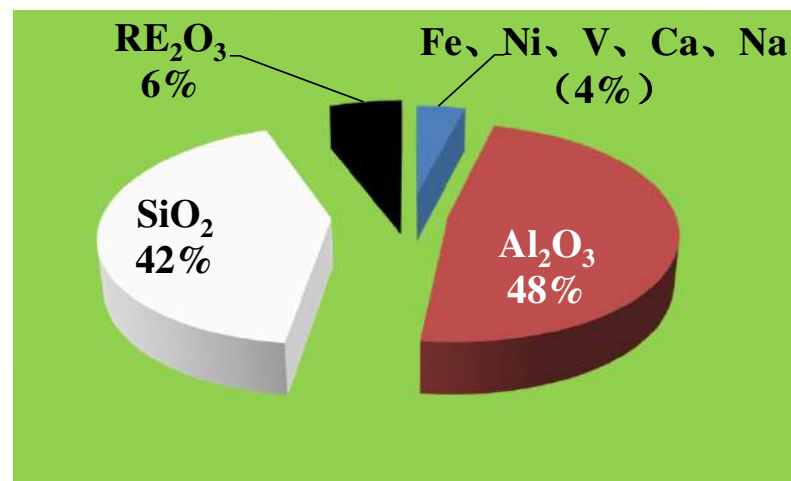
Decomposition reaction

Chemical composition of pollutant



Before treatment

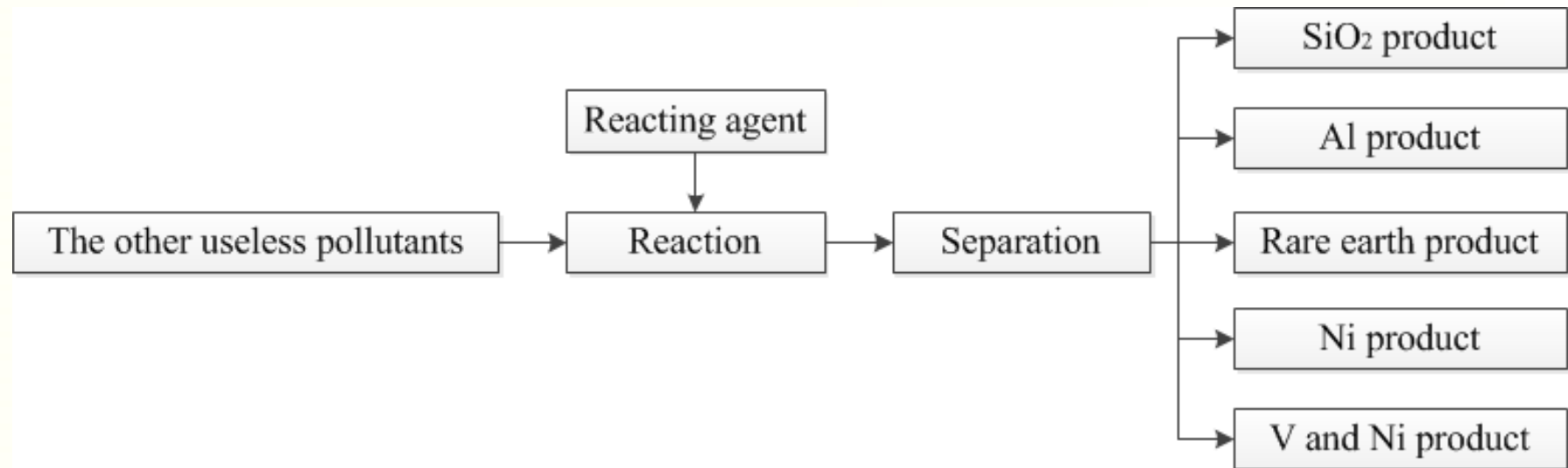
Elements
→
separation



After treatment

Decomposition reaction

Principle



Decomposition reaction

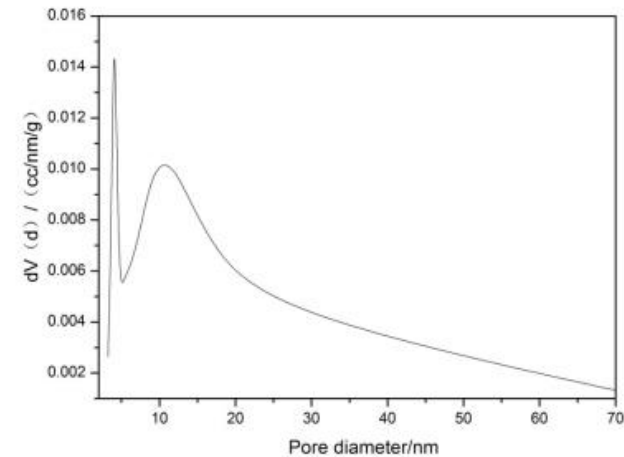
Step 1 Separation of Si

Method ➡ Acid-dissociation separation

Products ➡ SiO_2

Quality ➡ Purity $\geq 95\%$
Macroporous
Lightweight (0.4g/ml)

Application field ➡
1、Adsorbent
2、Support




Decomposition reaction

Step 2 Separation of Al

Method  Crystallization separation

Products  $\text{NH}_4\text{Al}(\text{SO}_4) \cdot 12\text{H}_2\text{O}$

Quality  Industrial level of CNS

Application field 
1、Purifying agent
2、Paper industry
3、Pharmaceutical industry
4、Light industry (tanning)



Decomposition reaction

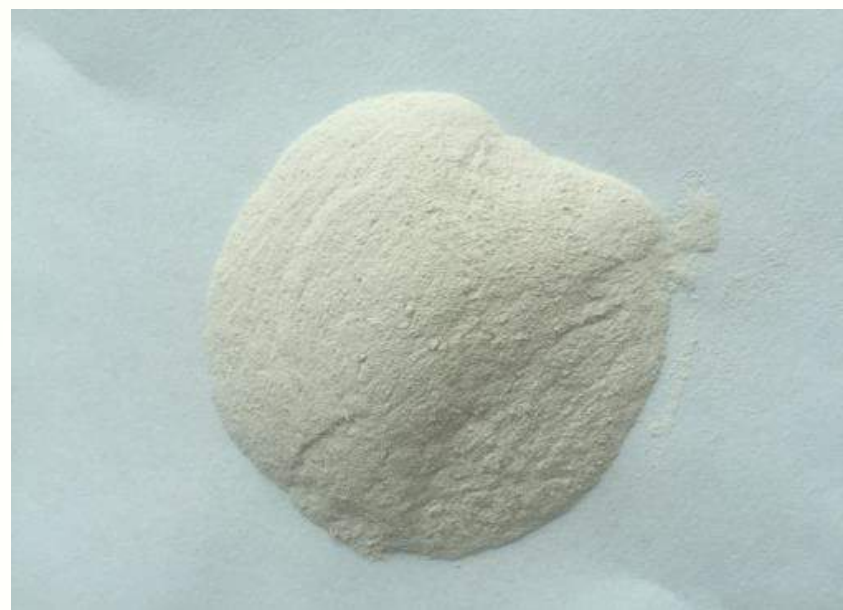
Step 3 Separation of RE

Method → Concentration separation

Products → RE-sodium sulfate double salt

Quality → Purity $\geq 95\%$

Application field →
1、Catalysis
2、Metallurgy
3、Ceramic
4、Textile
.....



Decomposition reaction

Step 4 Separation of Ni

Method → Crystallization separation

Products → $(\text{NH}_4)_2\text{Ni}(\text{SO}_4)_2 \cdot 10\text{H}_2\text{O}$

Quality → Purity $\geq 95\%$

Application
field → Smelting of Ni



Decomposition reaction

Step 5 Separation of other metals

Method ➡ **Alkali precipitation (still try our best for other method)**

Products ➡ **Mixture of Fe、V、Ca and little Ni**

Quality ➡ **Content of metals $\geq 50\%$**

Application field ➡ **Steelmaking workshop and other familiar plant**



中国石油




CHEMCHINA

中国化工集团公司

China National Chemical Corporation

Since 2006, our company invests a lot of research strength to solve the pollution problem of particle pollutants from FCC Unit. At present, we provide such services for more than a dozen units.

With our help, they completely solve the pollution problem of particle pollutants from FCC Unit.



With our technology , you can completely solve
the pollution problem of the
particle pollutants from FCC Unit .

Q&A