Our Product and Its Basic Statistic

FARMOUR

- Important that our material needs to be within 2-10 nanometer to have Quantum Dot properties.
- What is the size of nanoparticle that our supplier is able to produce? That affect the energy level of the nanoparticle.

1．总锌浓度测试 (Total zinc concentration test)

使用仪器 (Instruments used)

仪器名称 equipment name	规格型号Specifications and models
电感耦合等离子体串联质谱仪 Inductively coupled plasma tandem mass spectrometer	Agilent 8800 ICP-MS/MS
微波消解仪 Microwave digestion instrument	TOPEX+
分析天平 Analytical Balances	BSA224S

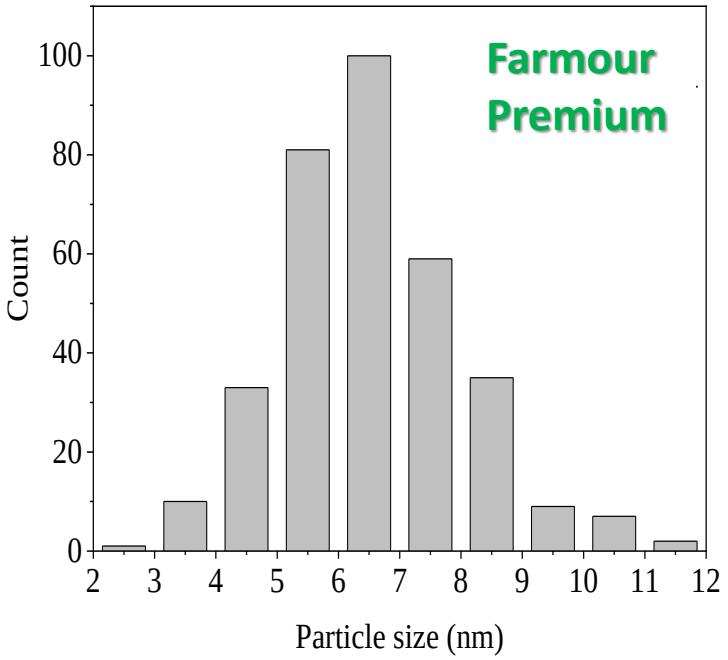
测试结果

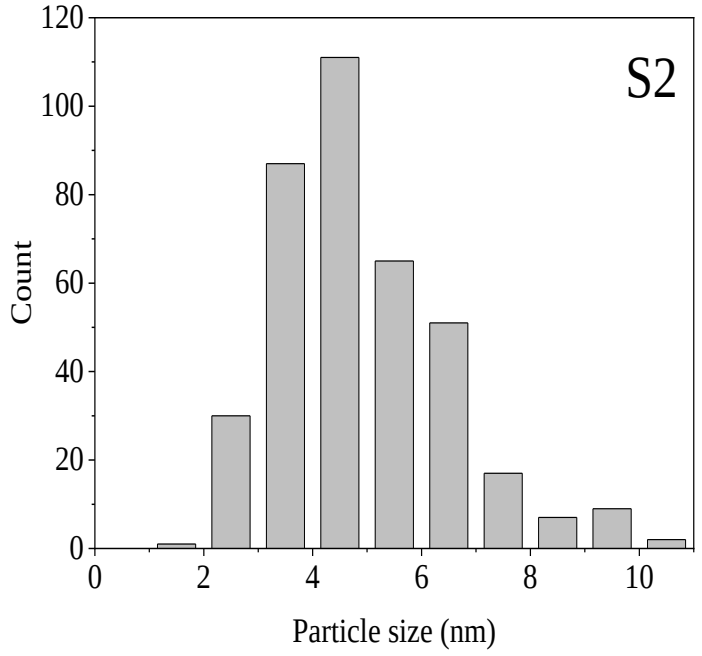
样品 sample	浓度density （g/L）
Farmour Premium (raw material)	237
S2 – code for another product	0.85
S3 – code for another product	0.83

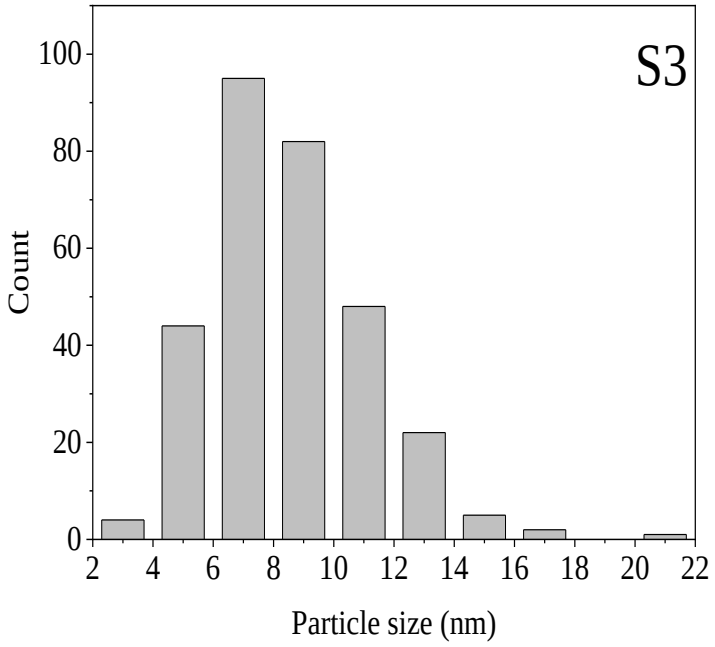
2．氧化锌 (ZnO) 测试 Zinc Oxide Test

采用透射电子显微镜（TEM）测试样品中ZnO颗粒的 数量浓度、粒径分布以及质量浓度。Transmission electron microscopy (TEM) was used to test the number concentration, particle size distribution and mass concentration of ZnO particles in the sample.

粒径分析结果 Particle size analysis results







2 . 氧化锌 (ZnO) 测试 Test – TEM (Transmission Electron Microscope)

粒径统计结果Particle size statistics results

样品sample	粒径分布 Particle size distribution	
	平均粒径(nm) The average particle size	中值粒径 (nm) median particle size
Farmour Premium*	6.5	6.5
S2 (other product of supplier)	4.9	4.6
S3 (other product of supplier)	8.5	8.2

* Farmour Premium – is using a product from our supplier, hence the name in China is different.

同步辐射检测 Synchrotron Radiation Detection

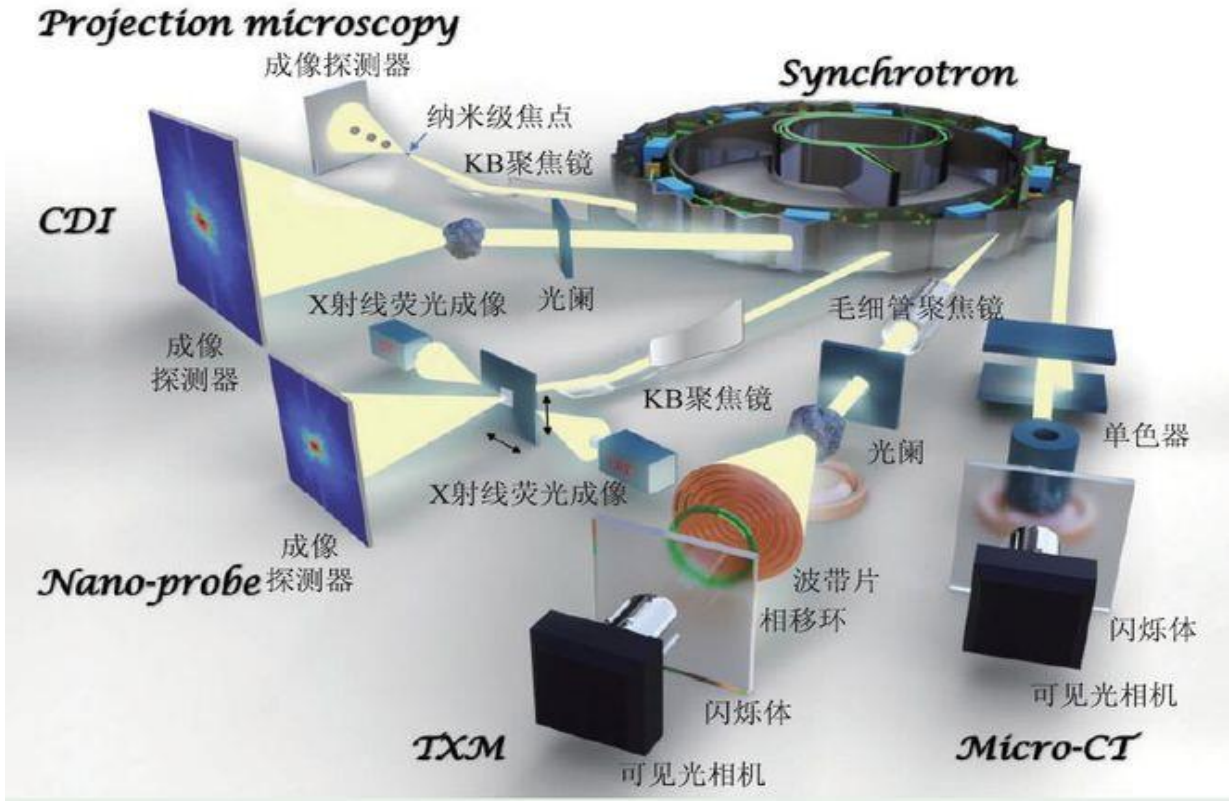
结论 conclusion

- 液体中，晶粒回转半径约 2.5nm；

In liquid, the radius of gyration of crystal grains is about 2.5nm

- 按球形计算，直径约 6.4nm 。

Calculated based on spherical shape, the diameter is about 6.4nm



Note : Synchrotron radiation (SR) occurs when a charge traveling at a relativistic speed in a synchrotron changes its direction of movement. SR covers a large spectrum of electromagnetic waves, from infrared to hard x-rays (in wavelength, tens of micrometers to less than 0.01 nm) (extracted from https://www.sciencedirect.com/topics/neuroscience/synchrotron-radiation)

同步辐射检测 Synchrotron Radiation Detection

Beijing Synchroton Radiation Facility

A large scientific facility located in Beijing, affiliated with the Institute of High Energy Physics, Chinese Academy of Sciences. The device was built in 1991 and is currently the only hard X-ray synchrotron radiation device operating in China.

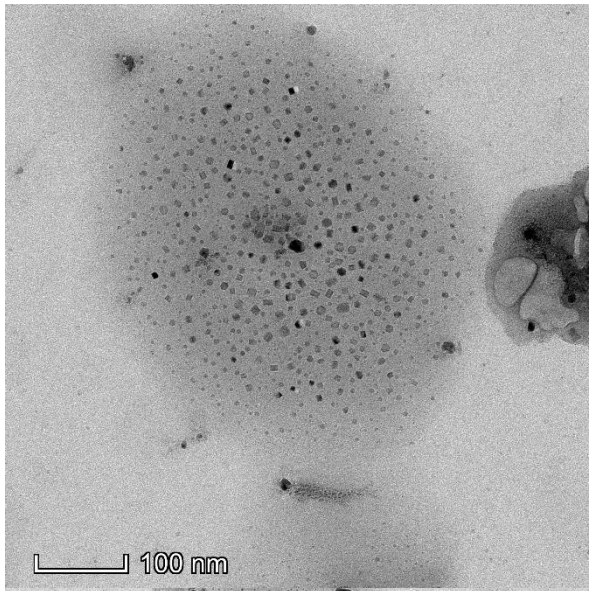
Farmour Premium

Believe to be world leading

Leading Nanotechnology

单晶量子点氧化锌

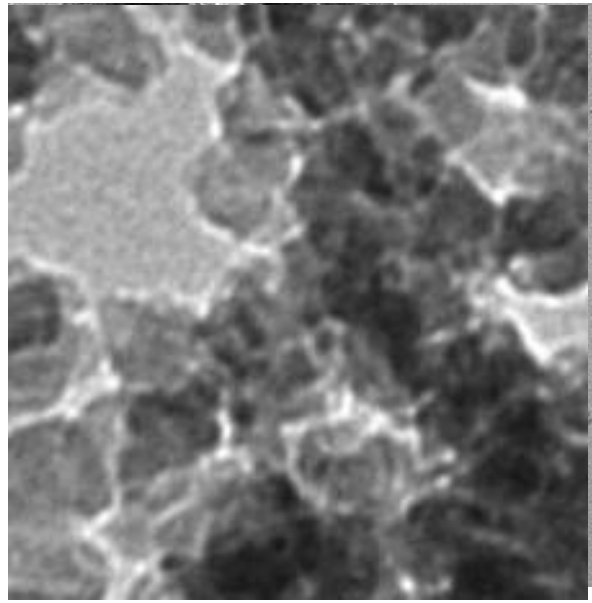
Monocrystalline quantum dots Zinc oxide



Most Others Status of Development

纳米多晶氧化锌簇

Nano-polycrystalline Zinc oxide clusters



纳米颗粒簇

nanoparticle clusters

透射电（TEM）
Transmission
Electron Microscope

执行单位:

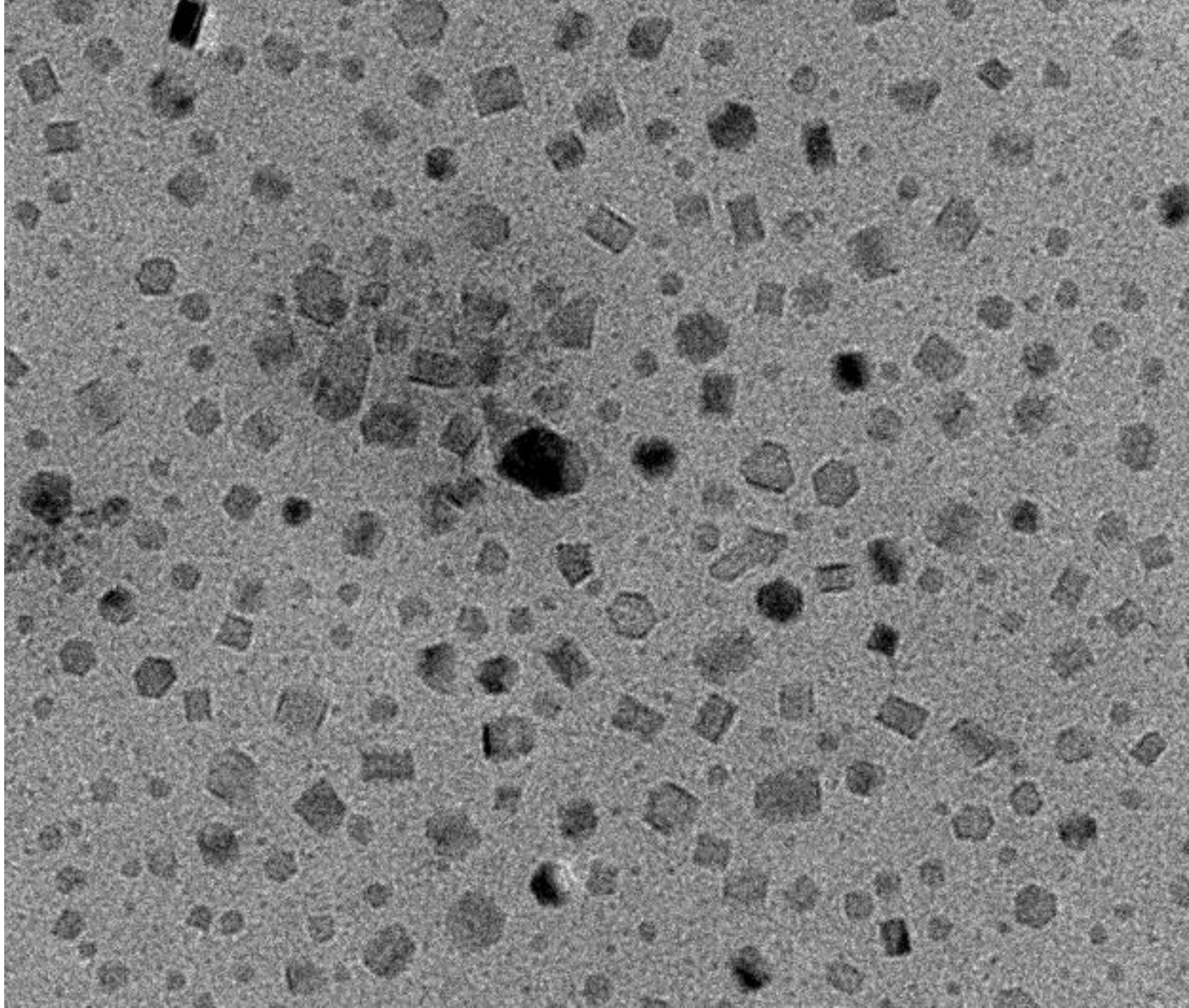
广东省科学院

测试分析研究所

Executed by:

Guangdong Academy of Sciences

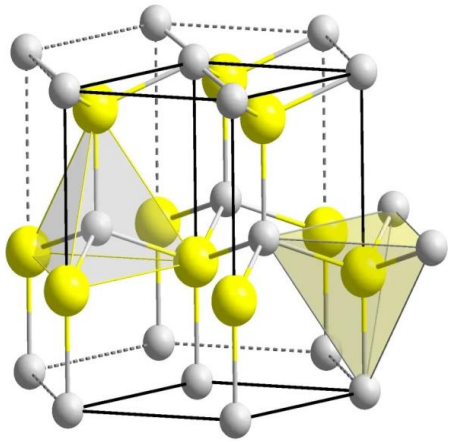
Testing and Analysis Institute

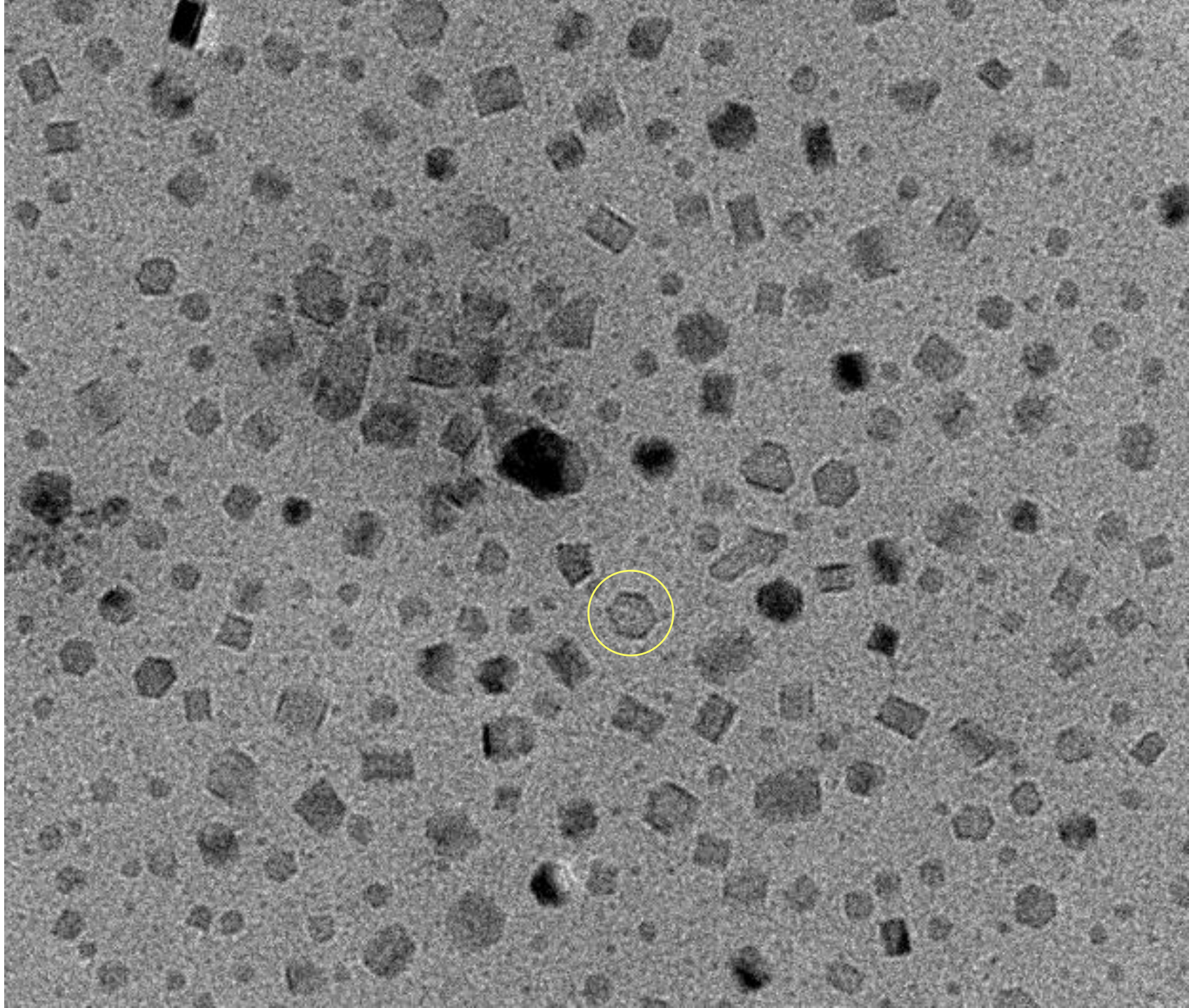


Farmour Premium

纤锌矿型晶体

wurtzite crystal

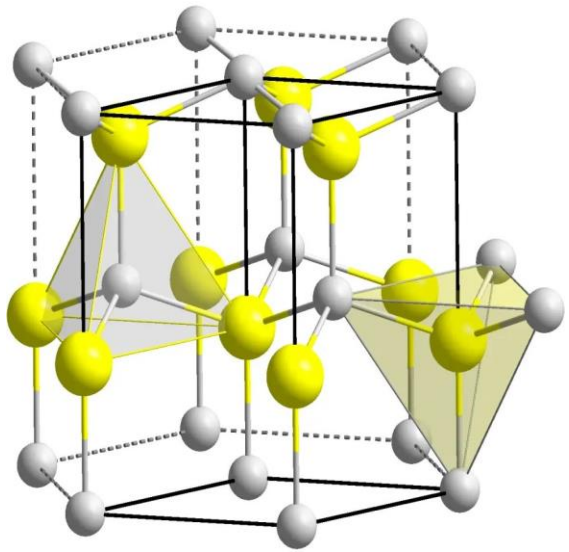




Farmour Premium

纤锌矿型晶胞（密排六方晶胞）

Wurtzite crystal(hexagonal close-packed unit cell)



FCC (Face-Centered Cubic)

面心立方晶格

单晶氧化锌 — 直接能隙半导体
Mono crystal zinc oxide - direct bandgap semiconductor

- 具有发光、压电、电光、闪烁等性能；

It has properties such as luminescence, piezoelectricity, electro-optical and flashing properties;

- 熔点高，易挥发，极性结晶，较难生长；

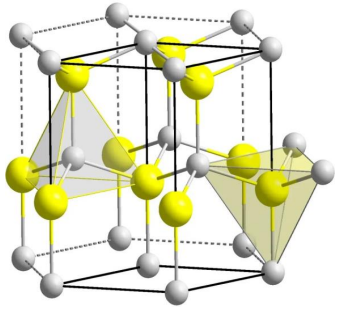
High melting point, easy to volatilize, polar crystallization, and difficult to grow;

- 紫外发光材料、移动通信基片材料和超快闪烁材料；

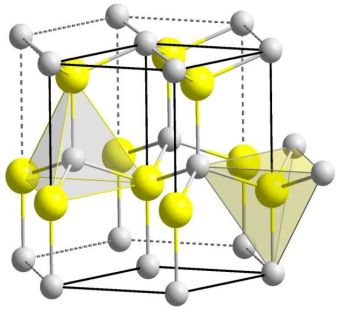
Ultraviolet luminescent materials, mobile communication substrate materials and ultrafast scintillation materials;

- 氧化锌与氮化镓的晶格失配度特别小，也是氮化镓外延生长最理想的衬底材料。

The lattice mismatch between zinc oxide and gallium nitride is particularly small, and it is also the most ideal substrate material for the epitaxial growth of gallium nitride.



氧化锌
ZnO



氮化镓
GaN

晶胞磊积成为晶体 Unit cells epilithically become crystals

晶胞： *cell* : Atoms are regularly arranged into a crystal lattice, and a smallest unit is taken from the crystal lattice that can fully express the crystal lattice structure;

单晶体： *mono-crystalline* : a crystal grain formed by the epiintegration of multiple unit cells with the same vector

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多晶体： *poly-crystalline* : An object composed of multiple crystal grains with different vectors.

单晶结构—— Farmour

Monocrystalline structure

规则对称结构，原子排列具有周性与平行对称性

Regular symmetrical structure, the atomic arrangement has periodic and parallel symmetry

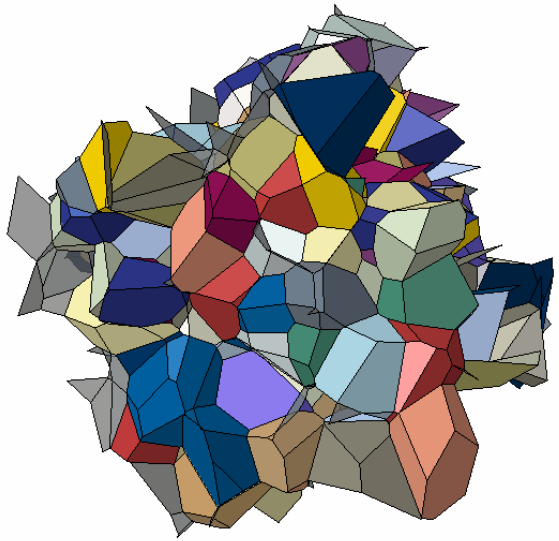
多晶结构（球形量子点）

Polycrystalline structure

杂乱无章的小晶粒

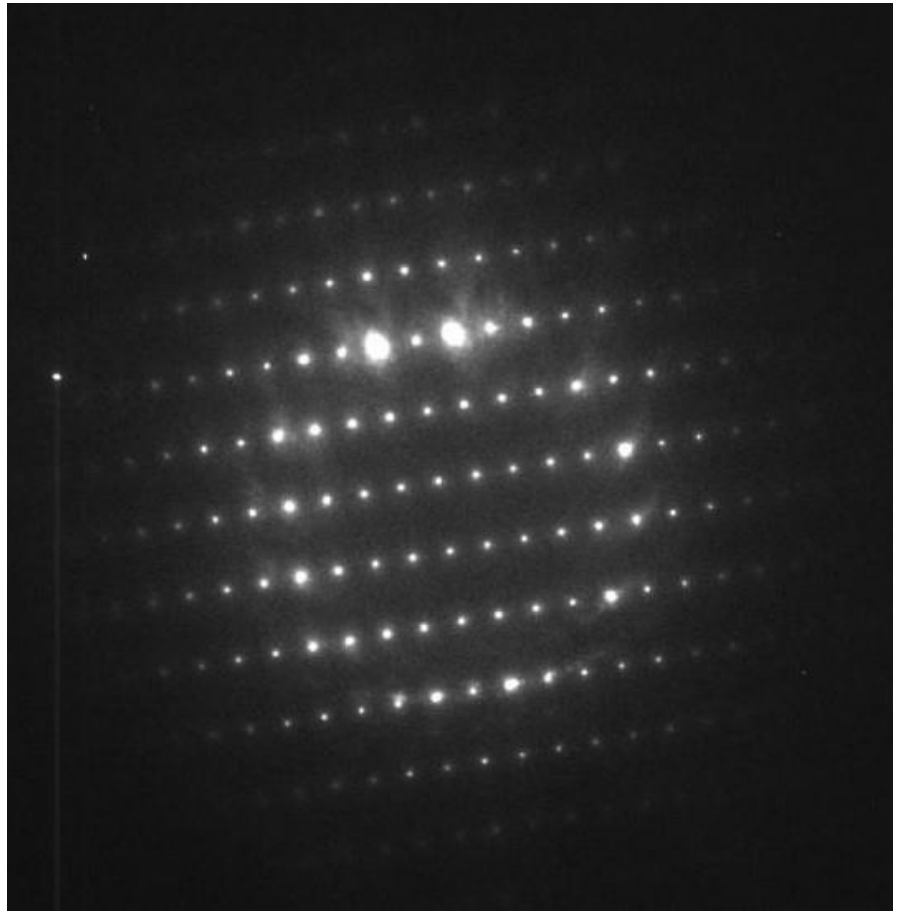
被范德华力团聚成簇

Messy little cell. Clustered together by van der Waals forces



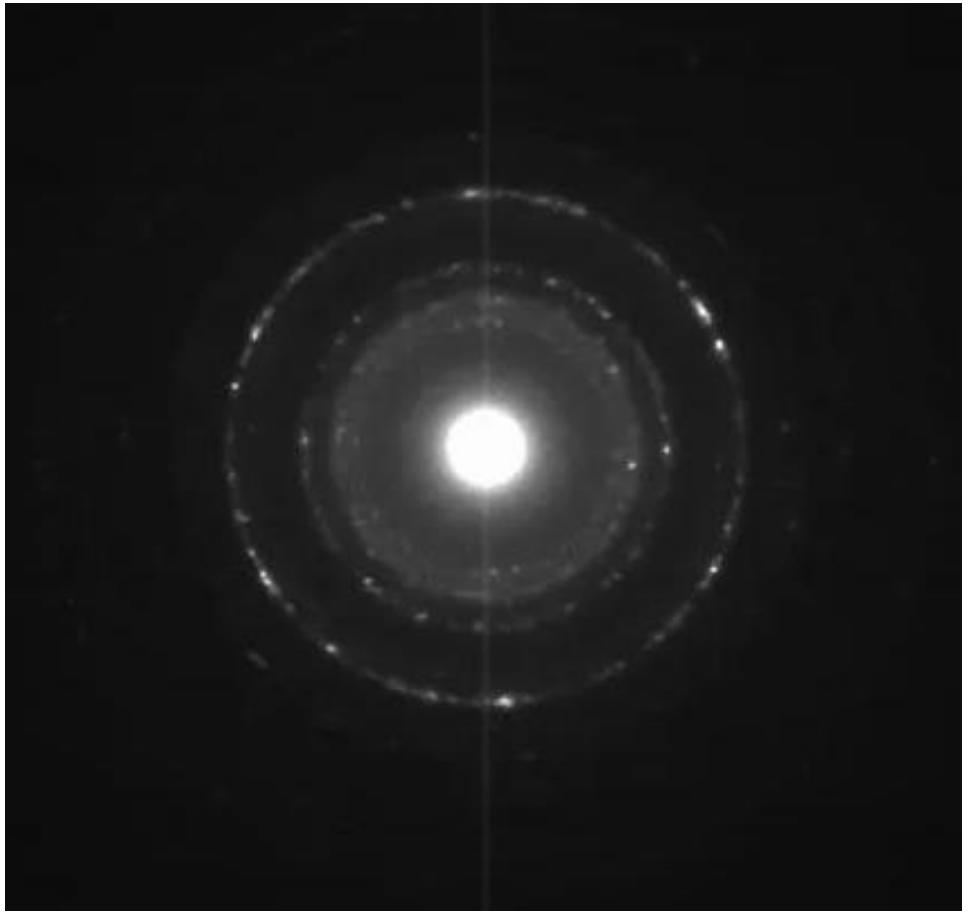
单晶体 电子衍射

Mono crystal electron diffraction



多晶体 电子衍射

Polycrystal electron diffraction



Farmour Premium 纤锌矿型晶体 (wurtzite crystal)

- 稳定性较高；

  Higher stability;

- O 原子键结4个 Zn原子，Zn原子也键结4个O原子；

  The O atom is bonded to 4 Zn atoms, and the Zn atom is also bonded to 4 O atoms

- 有较快的电子传递性能，以及较高的离子迁移率；

  Has faster electron transfer performance and higher ion mobility;

- 在半导体、新能源等领域，具有广泛的应用前景。

  It has broad application prospects in semiconductor, new energy and other fields.