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امورتدوین استانداردها

IGS

مشخصات فنی خرید

مولکولاریسیو ، نوع ۱۳X

Molecular Sieve , Type 13X



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شرکت ملی گاز ایران

دفتر مدیر عامل

## ابلاغ مصوبه هیأت مدیره

مدیر محترم پژوهش و فناوری و رئیس شورای استاندارد

باسلام،

به استحضار می‌رساند در جلسه ۱۶۴۷ مورخ ۱۳۹۴/۶/۸ هیأت مدیره، نامه شماره گ.۷۷۹۶۹/۰۰۰/۹ مورخ ۹۴/۶/۲ مدیر پژوهش و فناوری و رئیس شورای استاندارد در مورد تصویب نهایی استاندارد تحت عناوین جدول ذیل مطرح و مورد تصویب قرار گرفت:

ردیف	عنوان	شماره استاندارد
۱	مولکولارسیو نوع 4A	IGS-M-CH-051-2(0)
۲	مولکولارسیو نوع 5A	IGS-M-CH-051-3(0)
۳	مولکولارسیو نوع 13X	IGS-M-CH-051-4(0)

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## **FOREWORD**

This standard is intended to be mainly used by NIGC and contractors, and has been prepared based on interpretation of recognized standards, technical documents, knowledge, backgrounds and experiences in natural gas industry at national and international levels. Iranian Gas Standards (IGS) are prepared, reviewed and amended by technical standard committees within NIGC Standardization division and submitted to the NIGC's "STANDARDS COUNCIL" for approval. IGS Standards are subject to revision, amendment or withdrawal, if required. Thus the latest edition of IGS shall be checked/inquired by NIGC employees and contractors.

This standard must not be modified or altered by NIGC employees or its contractors. Any deviation from normative references and / or well-known manufacturer's specifications must be reported to Standardization division.

The technical standard committee welcomes comments and feedbacks about this standard, and may revise this document accordingly based on the received feedbacks.

## **GENERAL DEFINITIONS:**

Throughout this standard the following definitions, where applicable, should be followed:

- 1- "STANDARDIZATION DIV." is organized to deal with all aspects of industry standards in NIGC. Therefore, all enquiries for clarification or amendments are requested to be directed to mentioned division.
- 2- "COMPANY": refers to National Iranian Gas Company (NIGC).
- 3- "SUPPLIER": refers to a firm who will supply the service, equipment or material to NIGC whether as the prime producer or manufacturer or a trading firm.
- 4- "SHALL ": is used where a provision is mandatory.
- 5- "SHOULD": is used where a provision is advised only.
- 6- "MAY": is used where a provision is completely discretionary.

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## 1. SCOPE

This standard specification covers the minimum requirements for molecular sieve 13X in two different shapes (sphere and cylindrical extrudate) for use as a desiccant for removing of mercaptan from natural gas, LPG, C<sub>3</sub> and C<sub>4</sub>.

**Note:** It has a wide range of application where simple molecules such as moisture and/or carbon dioxide. Hydrogen sulphide, mercaptans and other organics are selectively adsorbed on the basis of polarity.

This standard specification provides properties, test methods, documentation and testing and inspection.

## 2. REFERENCES

Throughout this standard specification the following standards are referred to. The editions of these standards that are in effect at the time of issues of this standard specification (2014) shall, to the extent specified herein, form part of this standard specification. The applicability of changes in standards that occur after the date of this standard specification shall be mutually agreed upon by the purchaser and the supplier and/or manufacturer.

**ASTM D 2766 (2009)** "Test Method for Specific Heats of Liquids and Solids"

**ASTM D 4058 (2011)** "Test Method for Attrition and Abrasion of Catalysts and Catalyst Carriers"

**ASTM D 4164 (2013)** "Test Method for Mechanically Tapped Packing Density of Formed Catalyst and Catalyst Carriers"

**ASTM D 4179 (2011)** "Test Method for Single Pellet Crush Strength of Formed Catalyst Shapes"

**ASTM D 4513 (2011)** "Test Method for Particle Size Distribution of Catalytic Materials by Sieving"

**ASTM E 104 (2012)** "Practice for Maintaining Constant Relative Humidity by Means of Aqueous Solutions"

**ASTM E 725 (2012)** "Test Method for Sampling Granular Carriers and Granular Pesticides"

**BS 3482-2 (1991)** "Methods of Test for Desiccants, Part 2: Determination of Moisture Content"

**BS 3482-3 (1991)** "Methods of Test for Desiccants, Part 3: Determination of pH"

**ISO 9001 (2008)** "Quality Systems – Model for Quality Assurance in Design, Development, Production, Installation and Servicing"

**UOP 954 (2011) "Test Method for Loss on Ignition (LOI) for Fresh, Regenerated, Used, and Spent Catalysts, Catalyst Supports and Adsorbents"**

### **3. DEFINITION**

Molecular sieve type 13X is an alkali metal aluminosilicate zeolite. It is the sodium type of zeolite which belongs to the class of highly cubic crystalline porous aluminosilicates with an effective pore opening of approximately 10 angstroms (0.10 nm) and binder materials.

Molecular sieve 13X adsorbs molecules with a kinetic diameter of less than 0.10 nm and excludes those larger.

Typical chemical formula of sodium type of zeolite 13X (molecular sieve 13X) is:

$\text{Na}_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 2.5\text{SiO}_2 \cdot n\text{H}_2\text{O}$ .

This material is also known by trade designation MS13X.

### **4. REQUIREMENTS**

#### **4.1 Characteristics**

Molecular sieve type 13X shall be complied with the requirements given in Table 1 when tested in accordance with the specified methods.

#### **4.2 Sampling**

Sampling shall be carried out in accordance with ASTM E 725.

### **5. DOCUMENTATION**

The supplier and/or manufacturer shall provide technical information as a minimum requirement as follows:

**5.1** ISO 9001 certification for quality control of offered molecular sieve 13X for removing of mercaptan from natural gas, LPG, C<sub>3</sub> and C<sub>4</sub> issued by a recognized body.

**5.2** Approval test reports, original technical catalogues, manufacturing product data sheet and application procedure recommendation and guidelines.

**5.3** Material Safety Data Sheet (MSDS).

**5.4** Filled, signed and stamped data sheet stating in Annex A.

### **6. INSPECTION**

**6.1** The supplier and/or manufacturer set up and maintain such quality and inspection system to ensure the products comply with all aspects of the requirements of this standard specification.

**6.2** The supplier and/or manufacturer shall be responsible for carrying out all the tests and quality assurances required by this standard specification and shall maintain complete records of all such tests and qualifications. Such records shall be

available for review by the purchaser or its nominated inspector. These documents and test results shall be traceable with regard to the batch number.

**6.3** The supplier and/or manufacturer shall furnish to the purchaser a certificate of quality stating that each batch has been sampled, tested, and qualified in accordance with this standard specification and has been found to meet the requirements specified.

**6.4** The purchaser or its nominated inspector reserves the right to inspect a part or whole of the products during manufacturing and prior to packing and could witness any inspections and tests in accordance with this standard specification.

**6.5** Purchaser's inspector reserves the right to have access to the products at any time during manufacturing.

**6.6** The supplier and/or manufacturer shall provide all facilities necessary for carrying out all inspections and tests as required by this standard specification.

**6.7** Random sampling proportional to the quantity of each batch and frequency of inspections and tests as required by this standard specification shall be at the discretion of the inspector.

**6.8** If a sample rejected in any inspection or test, re-sample shall be carried out, in case of any rejection in new samples all products represented by such sampling shall be rejected.

**6.9** Inspection or tests that carried out by the purchaser's inspector, in no way relieves the supplier and/or manufacturer of his responsibilities and liabilities under the conditions, terms and inspection of this standard specification.

## **7. PACKAGING**

**7.1** The molecular sieve shall be suitably packed in approved containers. The containers shall be Big Bags or new steel drums with inner PE liner in accordance with the requirement of the purchase order.

**7.2** The containers shall be protected against all damages or defects which may occur during handling.

## **8. MARKING**

### **8.1 Marking of Containers**

Each container shall be legibly marked at least with the following information:

Product designation (type and trade name)

IGS No.

Net weight

Handling

Storage condition

Date of manufacture

Date of expiry

Order No.

Batch No.

Supplier and/or manufacturer's name and address

HMIS (including Health, Fire, Reactivity, Personal Protection, Specified Hazard, etc)

### **8.2 Instruction for Use (Loading/Unloading Instructions)**

The supplier and/or manufacturer shall provide complete sets of instruction for use and replacement of molecular sieve in service and refilling with an unused material.

## **9. STORAGE LIFE**

The molecular sieve shall meet the requirements of this standard specification after storage for 24 months from date of delivery at supplier and/or manufacturer's mentioned storage condition.

## **10. TEST REPORTS AND CERTIFICATES OF COMPLIANCE**

The supplier and/or manufacturer shall furnish test reports and certificates of compliance stating that the molecular sieve has been manufactured, tested and inspected in accordance with the requirements of this standard specification and any other requirements specified in the purchase order, and the results of the tests have been found to conform to such requirements.



**TABLE 1 – Physical and Chemical Properties**

Item	Property		Unit	Requirement				Test Method	Type of Test
				Spherical		Cylindrical			
1	Size, min 98%		mm	1.5 – 2.5	2.5 – 5	1.6	3.2	ASTM D 4513 for spherical and caliper <sup>a</sup> for cylindrical	Routine
2	Bulk Density		g/cm <sup>3</sup>	0.66 ± 0.05		0.62 ± 0.05		ASTM D 4164	Routine
3	Equilibrium (Static) Water Adsorption Capacity at 25 °C / 24h, min	10% rh 60% rh	mass %	19 27		19 27		ASTM E 104 <sup>b</sup>	Routine
4	Crushing Strength, min		N	30	70	25	60	ASTM D 4179	Routine
5	Package Moisture Content, 3 hour at 230 °C, max		mass%	1.5		1.5		BS 3482-2	Routine
6	Attrition Loss, max		mass%	0.1		0.2		ASTM D 4058	Routine
7	Residual Water Content, 3 hour at 550 °C, max		mass%	1.5		1.5		BS 3482-2	Routine
8	pH		---	11 ± 0.5		11 ± 0.5		BS 3482-3	Type <sup>c</sup>
9	Specific Heat, max		kJ/kg <sup>0</sup> K	1.07		1.07		ASTM D 2766	Type <sup>c</sup>
10	CO <sub>2</sub> Adsorption, min		mass%	17		17		Volumetric <sup>d</sup>	Type <sup>c</sup>
11	Loss on Ignition (LOI), 1 hour at 950 °C, max		mass%	Report <sup>e</sup>		Report <sup>e</sup>		UOP 954	Type <sup>c</sup>

a) Report the measurement of 100 pellets randomly.

b) Measure increasing mass percent after water adsorption.

c) For type test, a certificate shall be submitted from an independent laboratory.

d) Volumetric CO<sub>2</sub> Adsorption (Belsorp-Max).

e) Value depends on type of the binder.

**ANNEX A**  
**"Data Sheet for molecular sieve 13X"**

Type	Spherical ..... <input type="checkbox"/>	Cylindrical ..... <input type="checkbox"/>
Manufacturer's name		
Manufacturer's address		
Product designation		

**Table A – 1. Physical and Chemical Properties**

Item	Property	Unit	Value	Test Method	Remark
1	Size				
2	Bulk Density				
3	Equilibrium (Static) Water Adsorption Capacity at 25 °C / 24h, min	10% rh 60% rh			
4	Crushing Strength				
5	Package Moisture Content				
6	Attrition Loss				
7	Residual Water Content, 3 hour at 550 °C				
8	pH				
9	Specific Heat				
10	CO <sub>2</sub> Adsorption				
11	Loss on Ignition (LOI), 1 hour at 950 °C				
12	BET *				
13	XRD *				
14	Bulk Mechanical Strength *				

\* The value of this property should be compared with reference molecular sieve which confirmed by the purchaser and the certificate shall be submitted from an independent laboratory.

**Notes:**

1. This data sheet shall be filled, signed, and stamped by supplier and/or manufacturer.
2. Any deviation from this standard specification shall clearly be specified by supplier and/or manufacturer in following table:

<b>DEVIATION(S)</b>

**AUTHORIZED SIGNATURE:**

**COMPANY'S STAMP:**