BAM
Bundesanstalt für Materialforschung und -prüfung

Report

on Testing a Nonmetallic Material for Reactivity with Oxygen

Reference Number	2-1893/2012 E
Copy	1. Copy of 2 Copies
Customer	LOXEAL Srl PO Box 21 Via Marconato 2 20031 CESANO MADERNO ITALIEN
Order Date	July 4, 2012
Receipt of Order	July 16, 2012
Test Samples	Loxeal 83-21 for use as an anaerobic sealing material or adhesive in piping, valves and fittings or other components for gaseous oxygen service at temperatures up to 60 °C. BAM-Order No. 2.1/5
Receipt of Samples	April 26, 2012
Test Date	August 2, 2012 to August 3, 2012
Test Location	BAM – Working Group "Safe Handling of Oxygen"; building no. 41, room no. 120
Test Procedure or Requirement According to	DIN EN 1797: 2002-02 „Cryogenic Vessels - Gas/Material Compatibility" ISO 21010: 2004-07 „Cryogenic Vessels - Gas/Material Compatibility" Annex of pamphlet M 034-1 (BGI 617-1) "List of nonmetallic materials compatible with oxygen by BAM Federal Institute for Material Research and Testing.", by Berufsgenossenschaft Rohstoffe und chemische Industrie, Edition: September 2011; Rule BGR 500 "Betreiben von Arbeitsmitteln" part 2, chapter 2.32 "Betreiben von Sauerstoffanlagen", paragraph 3.17 "Lubricants and sealing materials", Edition: April 2008.

All pressures of this report are excess pressures.
This test report consists of page 1 to 4 and annex 1.

1 Documents and Test Samples

The following documents and samples were submitted to BAM:

1 Test Application
1 Safety Data Sheet
1 Material Data Sheet
50 ml Loxeal AN 83-21
Green translucent anaerobic adhesive

2 Test Methods

To evaluate the compatibility of the nonmetallic material for use in piping, valves and fittings or other components for gaseous oxygen service at temperatures up to 60 °C its ignition sensitivity to gaseous oxygen impacts was tested at 60 °C.

The nonmetallic material LOXEAL 83-21 has been tested in liquid and in cured condition.

3 Results

3.1 Ignition Sensitivity to Gaseous Oxygen Impacts

The test method is described in annex 1.

3.1.1 Liquid Material

Results:

Sample Temperature t_a [°C]	Initial Oxygen Pressure p_I [bar]	Final Oxygen Pressure p_F [bar]	Reaction on Impact
60	1	20	no reaction*
60	1	25	ignition on 2. impact
60	1	20	no reaction*

* within a series of five consecutive impacts

In two separate tests, each consisting of a series of five consecutive impacts, no reactions of the material with oxygen could be observed at a final oxygen pressure p_F of 20 bar and at a temperature of 60 °C.

3.1.2 Cured Material

Before performing the test, the required sample mass was cured for 12 hours at ambient temperature between two copper sheets according to the manufacture instructions.

Results:

Sample Temperature t_a [°C]	Initial Oxygen Pressure p_I [bar]	Final Oxygen Pressure p_F [bar]	Reaction on Impact
60	1	20	no reaction*
60	1	25	ignition on 1. impact
60	1	20	no reaction*

* within a series of five consecutive impacts

In two separate tests, each consisting of a series of five consecutive impacts, no reactions of the material with oxygen could be observed at a final oxygen pressure p_F of 20 bar and at a temperature of 60 °C.

4 Summary and Evaluation

A determination of the autogenous ignition temperature (AIT) and an investigation of the aging resistance in high pressure were not necessary as the material are not for use at temperatures greater than 60 °C.

According to DIN EN 1797: 2002-02 „Kryo-Behälter - Verträglichkeit von Gas/Werkstoffen" and to ISO 21010: 2004-07 „Cryogenic Vessels - Gas/Material Compatibility" the criterion for a positive reaction of the sample to gaseous oxygen impacts is a temperature rise of at least 20 °C.

On basis of the above-mentioned criterion and the test results, there are no objections with regard to technical safety, to use the Loxeal 83-21 as an anaerobic sealing material or adhesive in piping, valves and fittings, or other components for gaseous oxygen service at following operating conditions:

Maximum Temperature	Maximum Oxygen Pressure
60 °C	20 bar

This evaluation does not cover the use of the nonmetallic material for liquid oxygen service. For this application, a particular test for reactivity with liquid oxygen needs to be carried out.

5 Comments

The test results refer exclusively to the batch of the tested material.

Products on the market that contain a reference to BAM testing shall be marked accordingly. It shall be evident that only a sample of a batch has been tested and evaluated for oxygen compatibility. The reference shall not produce a presumption of conformity that monitoring of the production on a regular basis is being performed by BAM.

It shall be clear that the product may only be used for gaseous oxygen service. The maximum safe oxygen pressure of the product and its maximum use temperature as well as other restrictions in use shall be given.

BAM Federal Institute for Materials Research and Testing
12200 Berlin, January 31, 2013

Division 2.1
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