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Guideline (not under Configuration Control)

Appendix 16 Conditioning of Carbon Composites

Approval Process			
	Name	*Action*	*Affiliation*
Author	**Worth L.**	**02 Sep 2009:signed**	**IO/DG/COO/PED/FCED/VS**
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Change Log			
Appendix 16 Conditioning of Carbon Composites (27YH3U)			
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ITER Vacuum Handbook
Appendix 16

Guide to the Conditioning Carbon Composites for the ITER Project

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16 Vacuum Conditioning of Graphite and Carbon Composites

16.1 Scope

In order to remove absorbed impurities from graphite or carbon fibre composite materials it may be necessary to vacuum bake the raw material in a suitable vacuum furnace.

This Appendix outlines a process which may be used when graphite and carbon composites which are used on the ITER project are required to be baked.

It is intended that the *suppliers* using such processes should follow the guidance in this Appendix to achieve the requirements of the ITER Vacuum Handbook.

The *supplier* is at liberty to utilise other techniques not described in this Appendix provided that the components supplied comply with the requirements of the ITER Vacuum Handbook.

16.2 Procedures

The supplier shall perform a degassing cycle on components after machining to a procedure *accepted* by the ITER Vacuum Responsible Officer in accordance with Appendix 15 of the ITER Vacuum Handbook .

The temperature of the bakeout cycle will depend on the base pressure achievable in the vacuum furnace.

Leak tests of the vacuum furnace should be carried out in accordance with the ITER Vacuum Handbook.

16.2.1 Procedure for high temperature baking

The preferred outline procedure is as follows.

1. Condition the furnace.
2. Load the component parts.
3. Achieve a vacuum pressure of < 10 Pa.
4. Perform a leak test of the furnace. The acceptance leak rate will normally be < 10^{-6} Pa.m^3.s^{-1}
5. Increase the temperature of the furnace to 2000 °C, maintaining the pressure at < 10 Pa
6. Hold at 2000 °C for 24 hours maintaining the pressure at < 10 Pa.
7. Cool under vacuum to 400 °C.
8. Back fill the furnace with pure (UHP grade) Nitrogen to ~30 kPa.
9. Cool to room temperature.
10. Vent the furnace to atmospheric pressure with Nitrogen (zero grade).
11. Package the parts in *accepted* packaging and atmosphere.

16.2.2 Procedure for lower temperature baking

In order to maintain the furnace base pressure < 10^{-3} Pa the baking temperature may be lowered as follows:

1. Condition the furnace.
2. Load the component parts.
3. Achieve a vacuum of < 10^{-3} Pa.
4. Perform a leak test of the furnace. The acceptance leak rate will normally be < 10^{-6} Pa.m^3.s^{-1}
5. Increase the temperature of the furnace to 450 °C, maintaining the pressure < 10^{-3} Pa.
6. Hold at 450 °C for 24 hours maintaining the pressure at < 10^{-3} Pa.
7. Cool under vacuum to 400 °C.
8. Back fill the furnace with pure (UHP grade) Nitrogen to ~30 kPa.
9. Cool to room temperature.
10. Vent the furnace to atmospheric pressure with Nitrogen (zero grade).
11. Package the parts in *accepted* packaging and atmosphere.