



REPORT

AquaJet Ltd. required the characterization of three milled rubber samples by low temperature nitrogen adsorption and iodine adsorption.

Methods

Low temperature nitrogen adsorption:

The method is the most widely used, standard experimental and data evaluation procedure for the determination of surface area of solid particulate and/or porous samples.

Nitrogen adsorption/desorption isotherms were measured at $-196\text{ }^{\circ}\text{C}$, with a Nova 2000e (Quantachrome, USA) computer controlled volumetric gas adsorption apparatus. The samples were evacuated at 25 or $60\text{ }^{\circ}\text{C}$ (selected by AquaJet) for 24 h. Nitrogen was used as probe gas and the measurements were performed at the boiling point of nitrogen ($-196\text{ }^{\circ}\text{C}$). Seven data points were collected in the $0.05 - 0.35$ relative pressure range (the ratio of the equilibrium and the ambient pressure, respectively). The apparent surface area S_{BET} was obtained from the Brunauer e Emmett e Teller (BET) model [S. Brunauer, P. Emmett, E. Teller, Adsorption of gases in multimolecular layers, J. Am. Chem. Soc. 60 (1938) 309-319.].

Iodine adsorption number:

This parameter was determined according to the "Standard Test Method for Carbon Black—Iodine Adsorption Number" (D 1510 – 07 ASTM). The values reported here were calculated from three independent measurements.

Observations and results

The samples were distinguished by the ID provided by AquaJet as

Traditional ambient grinded rubber powder

Cryogenic grinded rubber powder

Waterjet grinded rubber powder

The temperature of the sample preparation was determined after consulting with the representative of AquaJet Ltd. Due to the very low nitrogen uptake, large sample size was required. Earlier we had tested similar samples from similar origin. That time, when the sample preparation temperature was higher we experienced the release of volatile compounds which condensed in the form of a brownish oil on the cooler part of the sample holder. With the present samples at the temperatures applied no similar phenomenon was observed.

The numeric results are summarized in Table 1.

Table 1. Numerical values from the nitrogen adsorption and iodine uptake measurements on milled rubber samples

Sample ID	Temperature of sample preparation °C	Low temperature nitrogen adsorption			Iodine adsorption number, mg/g
		Net sample size, g	Weight loss during evacuation, %	BET surface area, m ² /g	
Traditional ambient grinded rubber powder	25	11.8883	0.2	0.01	38±1.5
	60	11.8464	0.4	0.03	37±1.8
Cryogenic grinded rubber powder	25	15.3524	0.2	0.06	57±2.5
	60	15.3235	0.4	0.06	56±1.8
Waterjet grinded rubber powder	25	10.6423	0.3	0.12	64±2.7
	60	10.6177	0.6	0.13	67±1.0

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