



## On the heat produced by moistening pulverized bodies. New thermometrical and calorimetrical researches

Tito Martini

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XXVIII. *Intelligence and Miscellaneous Articles.*

ON THE HEAT PRODUCED BY MOISTENING PULVERIZED BODIES.

NEW THERMOMETRICAL AND CALORIMETRICAL RESEARCHES.

BY TITO MARTINI \*.

IN my second paper presented, last April, at the R. Istituto Veneto, I dealt with the calorific phenomena observed in moistening pulverized bodies. The method of experiments has already been described†; that is to say, of an arrangement whereby the liquid ascended to the powder, thoroughly dried, placed in a glass tube separated from it by a piece of light linen cloth. In this second series of experiments some modifications were introduced in order to keep the powder as dry as possible till the beginning of the experiment. The thermometer-bulb was placed in contact with the upper stratum of powder, it having been noticed that the increase of temperature was more marked from layer to layer.

In the following tables are indicated some of the principal results obtained with pure charcoal and pure silica ( $\text{SiO}_2$ ).

Pure Charcoal (gr. 25).

Name of the Liquid.	Temp. of the Air.	Temp. of the Liquid.	Temp. of the Charcoal.	Max. Temp.	Increase of Temp.	Liquid absorbed in cm. <sup>3</sup>
Distilled water .....	9	8.25	9.20	34.30	25.10	35 cm. <sup>3</sup>
Absolute alcohol .....	19.16	19.10	19.29	45.05	25.76	30
Sulphuric ether .....	10.71	11.10	10.89	29.48	18.59	28
Acetic ether .....	19.30	19.42	19.60	44.60	25.00	32
Benzene .....	20.10	20.15	20.30	33.60	13.30	34
Bisulphide of carbon.	7.10	6.12	7.20	28.90	21.70	29

Pure Silica (gr. 25).

Name of the Liquid.	Temp. of the Air.	Temp. of the Liquid.	Temp. of the Silica.	Max. Temp.	Increase of the Temp.	Liquid absorbed.
Distilled water .....	19.00	18.96	19.30	41.90	22.60	37 cm. <sup>3</sup>
Absolute alcohol .....	19.27	18.87	19.60	45.75	26.15	36
Sulphuric ether.....	14.65	14.60	14.69	46.21	31.52	35
Acetic ether .....	20.19	20.25	20.70	50.80	30.55	7
Benzene .....	19.50	19.49	19.60	31.70	12.10	40
Bisulphide of carbon...	18.84	18.95	19.32	31.05	11.73	38

I made also many experiments in order to determine the number of calories produced by moistening powder. I adopted a special

\* "Intorno ad calore che si sviluppa nel bagnare le polveri. Nuove ricerche termometriche e calorimetriche." *Atti del R. Istituto Veneto*, t. 9, serie vii. p. 927.

† *Atti del R. Istituto Veneto*, t. 8, serie vii. p. 502; *Phil. Mag.* vol. xlv., August 1897.

calorimeter made of thin sheet brass, consisting of two cylindrical tubes, one within the other, having a common axis. The base of the internal tube was perforated to allow the escape of air, when pouring the liquid upon the powder with which the tube was filled. A flannel disk placed at the base prevented the escape of the powder.

The powder was thoroughly dried before being poured into the internal tube, which was closed at the top with an indiarubber stopper, and suspended by three silk threads, within a vessel containing chloride of calcium. The external tube contained distilled water into which was immersed a delicate thermometer.

Calories developed by Charcoal moistened with Distilled Water.

Weight of the Charcoal.	Volume of the Water.	Calories-gr.	Calories by 1 gr. of powder.
44 gr.	60 cm. <sup>3</sup>	629.00	14.29
40	53	569.80	14.25
40	58	573.30	14.33
35	51	514.30	14.69
30	43	440.30	14.67

Calories developed by Silica moistened with Distilled Water.

Weight of the Silica.	Volume of the Water.	Calories-gr. developed.	Calories by 1 gr. of powder.
50 gr.	72 cm. <sup>3</sup>	677.10	13.54
50	70	684.50	13.69
45	63	603.10	13.40
40	60	558.70	13.97
40	62	558.70	13.97
40	66	555.00	13.87
35	53	477.30	13.64

Meissner, in his experiments \*, did not use a fixed weight of water; at one time he would use a quantity of water equal in weight to the powder, at another time a quantity double, and at times much less. In my own case, however, I always used that quantity of liquid which I found would be absorbed, by capillarity, by a quantity of charcoal or silica equal to that contained in the calorimeter. Had I poured on the powder a smaller amount of water, parts would have remained unmoistened; a larger quantity would have absorbed a part of the heat generated.

The foregoing results may be of interest, not only to physicists in general, but to students of geothermic phenomena. In fact, the reader will find in my original pamphlet an account of certain experiments in which silica, moistened with a proportionate quantity of water, rose from an initial temperature of 19° to that of 70°.

Venice, June 1898.

\* "Ueber die beim Benetzen pulverförmiger Körper auftretende Wärmetönung." Wiedemann's *Annalen*, xix. (1886).