# Determination of Water Content in Peanut Butter

## 1. Apparatus

a. AQUACOUNTER Coulometric Karl Fischer Titrator Model AQ-2100S
b. AQUACOUNTER Oil Evaporator EV-2000L
c. Grease Sampler (P/N E730017-A)
d. Evaporation Chamber Type A (P/N E323310-A)

## 2. Reagents

a. Anode solution: HYDRANAL Coulomat AG
b. Cathode solution: HYDRANAL Coulomat CG
c. Azeotropic Solvent: Dehydrated Toluene

## 3. Test Procedure

1) Add 10mL of dehydrated toluene into the evaporation chamber of EV-2000L.
2) Lift the heating block up to eliminate the moisture contained in the toluene.
3) Take approx. 0.3 g of sample using the grease sampler.
4) After the background level becomes stable, press the SAMPLE key.
5) Remove the glass stopper of evaporation chamber and insert the grease sampler into the evaporation chamber.
6) Press the TITRATION key to start the measurement.
7) When the titration is completed, discard the toluene and the sample in the evaporation chamber.

**Titration parameter settings:**

| Parameters | Values |
|---|---|
| Cal Mode | 0 |
| T-Timer | 10 min |
| Current | Medium |
| Heating Temperature | 120℃ |
| Carrier Gas Flow | 50mL/min |

## 4. Result and Discussion

**Table 1. Analytical Result of Peanut Butter**

| Sample | | Sample Size (g) | Water ($ugH_2O$) | Water (%) | Statistics | |
|---|---|---|---|---|---|---|
| A03-068-01 | 1 | 0.3764 | 3944.2 | 1.0479 | **AVG(3)** | **1.04 %** |
| | 2 | 0.3213 | 3308.4 | 1.0291 | SD | 0.011% |
| | 3 | 0.3135 | 3229.8 | 1.0302 | CV | 1.0 % |
| A03-068-02 | 1 | 0.3140 | 3554.8 | 1.1321 | **AVG(3)** | **1.12 %** |
| | 2 | 0.3800 | 4303.1 | 1.1324 | SD | 0.018% |
| | 3 | 0.3104 | 3419.7 | 1.1017 | CV | 1.6 % |
| A03-068-03 | 1 | 0.3340 | 3727.9 | 1.1161 | **AVG(3)** | **1.10 %** |
| | 2 | 0.3296 | 3649.9 | 1.1074 | SD | 0.014% |
| | 3 | 0.3124 | 3400.5 | 1.0885 | CV | 1.3 % |

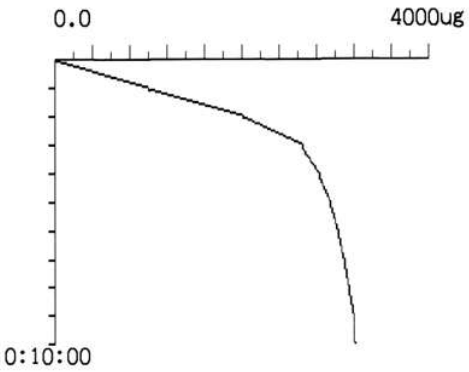
Table 1. shows the analytical result of peanut butter samples. Using the oil evaporator EV-2000L, good reproducibility and water content very close to the customer report was obtained.

On the other hand, the measurement using solid evaporator EV-2000 was examined and only 50% of the water was measured at heating temperature of 125 degree C, extraordinary long measurement time was taken. Figure 1 through 3 show the titration curve of each sample, Figure 4 shows the titration curve of the measurement using solid evaporator.

Sample should be stirred and mixed well prior to sampling.

********** AQ-2100 Result **********

| | |
|---|---|
| Analysis Name | Peanst Butter |
| Date | 2005/04/11 17:11 |
| Sample No. | 2 |
| ID Code | A03-068-01 |
| Total H20 | 3229.8 ug |
| Tit Time | 0:10:01 |
| Back Ground | 3 ug/min |
| H20 | 3229.8 ug |
| Size | 0.31350 g |
| *Conc | 1.0302 % |
| Temp. | 20.0 °C |
| Humid. | 65.0 % |



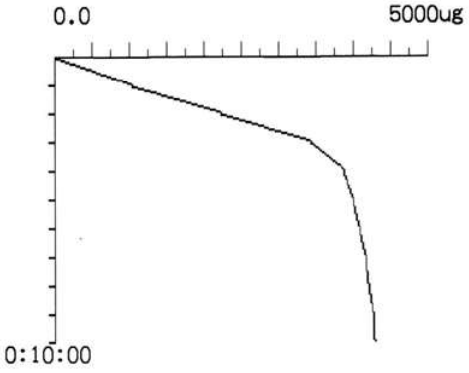

T-Data

| Time | ug | Conc |
|---|---|---|
| 0:01:00 | 1002.0 | 0.3196 % |
| 0:02:00 | 2027.6 | 0.6468 % |
| 0:03:00 | 2656.4 | 0.8473 % |
| 0:04:00 | 2842.6 | 0.9067 % |
| 0:05:00 | 2961.8 | 0.9448 % |
| 0:06:00 | 3046.1 | 0.9716 % |
| 0:07:00 | 3109.5 | 0.9919 % |
| 0:08:00 | 3164.0 | 1.0093 % |
| 0:09:00 | 3203.4 | 1.0218 % |
| 0:10:00 | 3229.8 | 1.0302 % |

Fig 1. Titration curve for the sample A03-068-01

********** AQ-2100 Result **********

| | |
|---|---|
| Analysis Name | Peanst Butter |
| Date | 2005/04/12 11:00 |
| Sample No. | 2 |
| ID Code | A03-068-02 |
| Total H20 | 4303.1 ug |
| Tit Time | 0:10:01 |
| Back Ground | 3 ug/min |
| H20 | 4303.1 ug |
| Size | 0.38000 g |
| *Conc | 1.1324 % |
| Temp. | -------- |
| Humid. | -------- |



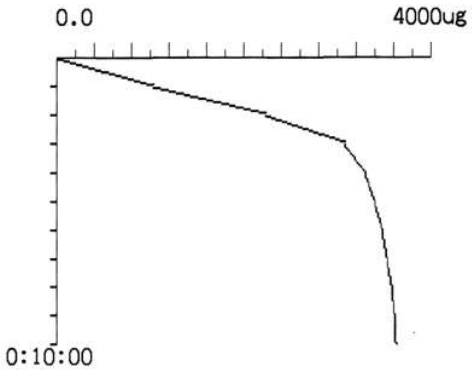

T-Data

| Time | ug | Conc |
|---|---|---|
| 0:01:00 | 1048.3 | 0.2759 % |
| 0:02:00 | 2249.7 | 0.5920 % |
| 0:03:00 | 3451.0 | 0.9082 % |
| 0:04:00 | 3875.0 | 1.0197 % |
| 0:05:00 | 4000.2 | 1.0527 % |
| 0:06:00 | 4100.5 | 1.0791 % |
| 0:07:00 | 4167.9 | 1.0968 % |
| 0:08:00 | 4222.4 | 1.1112 % |
| 0:09:00 | 4272.8 | 1.1244 % |
| 0:10:00 | 4303.1 | 1.1324 % |

Fig 2. Titration curve for the sample A03-068-02

********* AQ-2100 Result *********

| | |
|---|---|
| Analysis Name | Peanst Butter |
| Date | 2005/04/12 12:38 |
| Sample No. | 3 |
| ID Code | A03-068-03 |
| Total H20 | 3649.9 ug |
| Tit Time | 0:10:01 |
| Back Ground | 3 ug/min |
| H20 | 3649.9 ug |
| Size | 0.32960 g |
| *Conc | 1.1074 % |
| Temp. | -------- |
| Humid. | -------- |



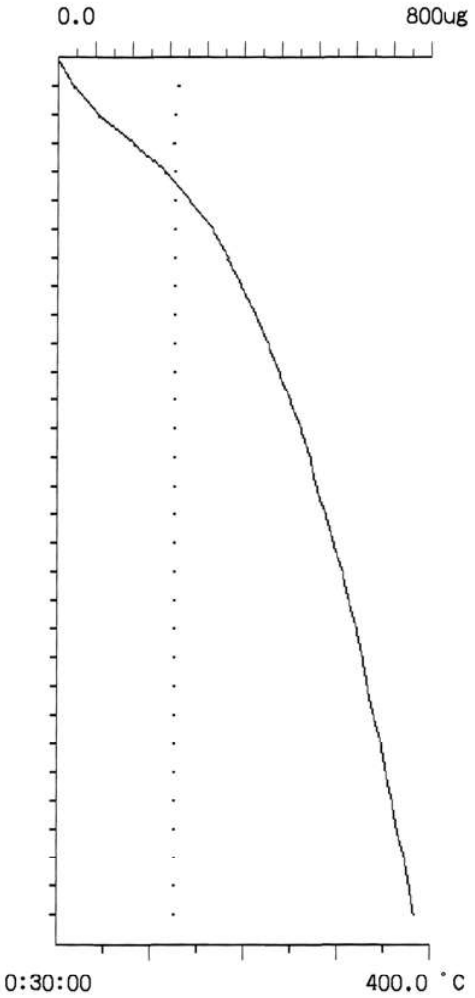

T-Data

| Time | ug | Conc |
|---|---|---|
| 0:01:00 | 1044.6 | 0.3169 % |
| 0:02:00 | 2246.0 | 0.6814 % |
| 0:03:00 | 3088.4 | 0.9370 % |
| 0:04:00 | 3302.7 | 1.0020 % |
| 0:05:00 | 3402.0 | 1.0322 % |
| 0:06:00 | 3486.4 | 1.0578 % |
| 0:07:00 | 3540.8 | 1.0743 % |
| 0:08:00 | 3590.3 | 1.0893 % |
| 0:09:00 | 3620.5 | 1.0985 % |
| 0:10:00 | 3649.9 | 1.1074 % |

Fig.3 Titration curve for the sample A03-068-03

********* AQ-2100 Result *********

| | |
|---|---|
| Analysis Name | Peanst Butter |
| Date | 2005/04/11 15:33 |
| Sample No. | 1 |
| ID Code | A03-068-01 |
| Total H20 | 767.8 ug |
| Tit Time | 0:30:02 |
| Back Ground | 4 ug/min |
| H20 | 767.8 ug |
| Size | 0.15350 g |
| *Conc | 0.5002 % |
| Temp. | 20.0 °C |
| Humid. | 65.0 % |




T-Data

| Time | ug | Conc | °C |
|---|---|---|---|
| 0:01:00 | 33.9 | 220.8 ppm | 129 |
| 0:02:00 | 88.1 | 573.9 ppm | 125 |
| 0:03:00 | 164.3 | 0.1070 % | 124 |
| 0:04:00 | 231.4 | 0.1507 % | 125 |
| 0:05:00 | 285.7 | 0.1861 % | 126 |
| 0:06:00 | 333.9 | 0.2175 % | 126 |
| 0:07:00 | 369.0 | 0.2404 % | 126 |
| 0:08:00 | 399.0 | 0.2599 % | 125 |
| 0:09:00 | 429.0 | 0.2795 % | 125 |
| 0:10:00 | 454.0 | 0.2958 % | 125 |
| 0:11:00 | 479.0 | 0.3121 % | 125 |
| 0:12:00 | 502.9 | 0.3276 % | 125 |
| 0:13:00 | 523.9 | 0.3413 % | 125 |
| 0:14:00 | 543.9 | 0.3543 % | 125 |
| 0:15:00 | 559.8 | 0.3647 % | 125 |
| 0:16:00 | 578.7 | 0.3770 % | 125 |
| 0:17:00 | 596.6 | 0.3887 % | 125 |
| 0:18:00 | 613.6 | 0.3997 % | 125 |
| 0:19:00 | 628.5 | 0.4094 % | 126 |
| 0:20:00 | 643.4 | 0.4192 % | 125 |
| 0:21:00 | 658.3 | 0.4289 % | 125 |
| 0:22:00 | 668.1 | 0.4352 % | 126 |
| 0:23:00 | 683.0 | 0.4450 % | 126 |
| 0:24:00 | 697.9 | 0.4547 % | 125 |
| 0:25:00 | 707.8 | 0.4611 % | 126 |
| 0:26:00 | 722.7 | 0.4708 % | 125 |
| 0:27:00 | 732.6 | 0.4773 % | 126 |
| 0:28:00 | 747.5 | 0.4870 % | 126 |
| 0:29:00 | 757.3 | 0.4934 % | 126 |
| 0:30:00 | 767.8 | 0.5002 % | 126 |

Fig.4 Titration curve for the sample A03-068-0 1 using Solid evaporator EV-2000.