

PM gravimetric measurements and blank filters

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A significant weight increase of the quartz (Whatman QMA 47mm) field blank filters (FB) of around 140 µg has been found during gravimetric PM10 measurements in 2006. Two types of samplers (single without- and sequential samplers with a temperature controlled storage) showed about the same results (table 1). Since the weight increase of the FB filters did not comply with EN 14907 demands, further research has been done. The manufacturer (Whatman) heats the quartz filters to 500°C in order to obtain the required purity. Short after the heating process the filters are packed and hermetically sealed. Our hypothesis is that adsorption of water vapour from ambient air could be the root cause of a significant mass increase. Also seasonal effects on the weight increase of FB filters have been observed. Possibly adsorption of volatile organic compounds also plays a part in the mass increase of quartz filters.

Table 1. Weight increase of 47mm quartz fibre filters

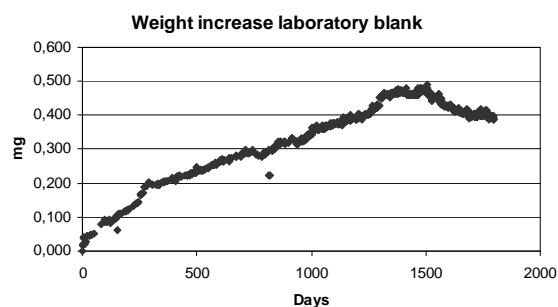
Device	Average weight increase FB (n, sd) µg
Derenda single filter holder	133 (32, 15µg)
Derenda sequential sampler	146 (32, 17µg)

In the Netherlands all air quality laboratories agreed to use one type and brand quartz fibre filters for PM2.5 measurements according to the EN 14907. EN 14907 is the European gravimetric reference method on determination of the PM2.5 mass fraction of suspended particulate matter. This standard prescribes the use of FB filters and laboratory reference blank filters (RB). The mass change of a RB filter between two consecutive weighing sessions as well as the mass change of a FB filter should be less than 40 µg. One of the RB filters in the weighing room of Municipal Health Service Amsterdam has been in use for approximately 1800 days. This specific filter has always complied to the EN 14907 demand of 40 µg mass change at most over two consecutive weighing sessions. However the filter showed a slowly increasing mass of almost 500 µg over the first 1500 days (0,3 µg/day). We believe a mass increase of filters could be caused by adsorption of water vapour. Estimated, from these

observations, Whatman QMA 47 mm quartz fibre filters kept at 20°C and 50% RH will be completely saturated with water after about 1500 days. (figure 1).

Additional to the EN 14907 weighing procedures, a pre treatment of the dry quartz filters has been added to our standard operational procedures. From January 2007 all filters have been stored for at least a month in opened packages in a with water vapour saturated environment at 20°C. The weight increase of three of these filters has been measured over 80 days. The weight increase was 5,1 µg/day, probably due to water adsorption. Compared to the RB filters the saturation process became almost 7 times faster, so complete saturation should be reached after about 3 months.

Figure 1. Weight increase of a RB



Before implementation of this procedure (2006) FB filters gained 140µg (n=64, sd=11 µg) on average. Whereas after implementation in 2007 FB filters gained only 55µg (n=384, sd=3 µg) on average.

EN 14907 (2005). *Standard gravimetric measurement method for the determination of the PM2,5 mass fraction of suspended particulate matter.* CEN/TC 264.