

## **Long-term behaviour epsilon. Study of the long-term behaviour of the degradation of construction products emissivity with reduced emissivity due to artificial and natural ageing**

In recent times numerous construction products which use the properties of low-emissivity plastics or coatings to improve the heat insulation properties (on the product surface and/or on the inside of the product depending on the product itself) have been pushed onto the market. The ageing of the low-emissivity properties, the "coverage", for example due to dust, and the influence of these effects on the emissions level in addition to suitable test methods are not sufficiently known in order to state a measurement value for a longstanding condition.

The influence of some effects on the permanence of the reduced emissions level in construction materials was determined in the course of the previous "Ageing Epsilon" project. In this case, ageing due to UV load, climate change and acc. to the valuation criteria of EOTA was carried out in the laboratory. Furthermore, test specimens were fitted to an outdoor weathering stand. The measured results show that only extreme loads result in changes to the emissions level. The effects of different artificial ageing processes were investigated over a long timeframe during the course of this project in order to provide a description of an ageing process dependent on the fitting location as near to reality as possible.

The most important findings for the products investigated are summarised below:

- The samples were shown to be extremely robust with regard to their emissions level when subjected to ageing influences, as was also shown in previous research projects.
- Severe ageing of the emissions level, up to destruction of the samples, resulted from unprotected outside weathering. However, this loading does not correspond to regular use of the tested IR-reflecting products.
- The influence of a thin dust layer on the emissions level is negligible.
- A generally applicable quick test procedure which enables precise prediction of the emissions level ageing was not found. However, the ATR spectroscopy carried out showed that classification of the properties for the investigated products could be carried out using the type of external protective layer. This point must be further clarified.
- The emissions level of the products tested were shown to be extremely robust. Only extremely severe loadings resulted in increases in the level. For this reason, the author is of the opinion that a generally applicable quick test procedure for precise prediction of IR-reflecting product ageing behaviour is not necessary, and makes the following recommendations:
- The procedure for conditioning / ageing stated in prEN16012 represents a loading or ageing process which is simple to carry out. Minimum require-

ments on the permanence of the IR-active product emissions level can be made with the help of this test procedure. It is recommended that this minimum requirement is adhered to.

- The rated values for aged products stated in prEN 16012, Table 2 are, with the exception of aluminium foil, considerably too low. The stated values at a level of  $\varepsilon = 0.05$  correspond to products with an extremely low emissions level. The authors propose deleting the table.
- The measured value for the emissions level of a product with IR-reflecting properties can be determined by using a factor of 1.2 times the rated value based on DIN V 4108-4.