

Un esempio di caratterizzazione dimensionale di fibre vetrose artificiali

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KEY WORDS

SVF; fibre size characterization; length weighted mean diameter; log normal distribution

SUMMARY

«An example of size characterization of synthetic vitreous fibres». **Background:** *The size characterization of synthetic vitreous fibres must be carried out to include or exclude them from classification as a carcinogen and to conduct in vivo and in vitro toxicity studies. The length weighted geometric mean diameter, together with its standard error, determines the toxicity of fibres according to Italian legislation relating to the provisions for classification, packaging and labelling of dangerous substances as formulated in the European Commission Directive 97/69/EC. Up to now there is no national or European guideline, which provides a technical procedure to obtain the size characterization parameters.* **Objectives:** *The aim of this paper was to measure the fibre size of some rock wool and ceramic fibre samples in order to estimate the length weighted geometric mean diameter and its standard error, and to calculate the related toxicity parameter. We also wanted to analyse whether the measured lengths and diameters were log-normally distributed or not.* **Methods:** *We reduced the fibre length by the two most used techniques: cutting the rock wool fibres with a blade and pressing the ceramic fibre material in a die for infrared spectroscopy. Each sample was suspended in water by ultrasonic agitation and a small amount of it was filtered on a polycarbonate membrane. The diameter and length measurements of 300 fibres were carried out by a scanning electron microscope and the experimental data were analysed to calculate the main statistical parameters. The size distributions obtained for each sample were studied using the Kolmogorov-Smirnov test for normality and Q-Q plot.* **Results:** *The fibre dispersion on the polycarbonate membrane area was suitable: there was a sufficient number of fibres to be measured without an excessive fibre overlapping. The main statistical parameters were calculated for two different cutting times ($t=20$ min and $t=1$ h) and two different applied forces ($F=1.2$ t, corresponding to a pressure of 90 MPa, and $F=1.6$ t, corresponding to a pressure of 120 MPa). For each substance the two sets of measurements were acquired by two different operators. This gave us an estimation of the variability of the calculated statistical parameters in the worse case (different applied forces or cutting times, and different operators). For the ceramic fibres only, one of the two operators carried out the measurements for both the applied forces to obtain more close information about the variability related to the method itself. The normality tests and the Q-Q plots showed that some of the data were far from having a lognormal distribution due to the tails of the distributions.* **Conclusions:** *Both fibre length reduction methods were effective, but the press method was found to be much easier and*

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quicker. The data obtained showed that it is relatively easy to estimate the main statistical parameters related to the size characterization of synthetic vitreous fibres. Nevertheless, further studies must be carried out in order to better evaluate the method reproducibility and the variability of the parameters estimated by one and more operators, and to associate an error with the cancerogenicity parameter.

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