Substitutes not without risks

Substance	Health effects	Conclusions
Fibreglass	- increased incidence of lung cancers in glass wool production workers [3] - IARC Class 2B "possibly carcinogenic to man" - listed by the U.S. as "a substance which may reasonably be anticipated to be a carcinogen" [4] - listed by German MAK Commission as "a substance to be treated as if a probable cause of cancer"	"Our review then examines the carcinogenic potency of glass fibers to humans in comparison with asbestos fibers and concludes that on a fiber-per-fiber basis, glass fibers may be as potent or even more potent than asbestos." (Infante et al., Am. J. Ind. Med., 1994)
Silicon carbide whiskers		"Silicon carbide whiskers have the potential, at least, to cause significant immediate and long-term pulmonary damage. It appears to be more toxic than crocidolite." (Vaughan et al., Env. Res., 1993)
Glass and rock wool	- excess cancers of trachea, bronchus and lung detected among production workers (3) - IARC Class 2B "possibly carcinogenic to man" - listed by German MAK Commission as "a substance to be treated as if a probable cause of cancer"	"... when the fibre doses were expressed as the number of fibres per culture area, the asbestos and MMVF appeared equally effective in human mesothelial cells." (Pelin et al., Environmental and Molecular Mutagenesis, 1995)
Aramid fibre	- has caused fibrosis and lung tumours in inhalation exposure studies on rats [1] - "exposures to these fibres should be controlled to the same degree as that required for asbestos until data supporting a lesser degree of control become available." [2]	"Results of cytotoxicity tests indicated that Aramid was as toxic to hamster trachael epithelial cells and rat lung fibroblast cells as were crocidolite and chrysotile asbestos when expressed on both an equal mass and equal fiber number basis." (Marsh et al., Drug and Chem. Toxic., 1994)
All respirable and durable fibres		"Exposures to these fibres should be controlled to the same degree as that required for asbestos until data supporting a lesser degree of control become available." (IPCS, 1993)

Refractory ceramic fibre (RCF)	- evidence of fibrogenicity and carcinogenicity in animal implantation and inhalation studies [5] - IARC Class 2B "possibly carcinogenic to man" - listed by German MAK Commission as "a substance with known carcinogenic potential in humans" - listed by the U.S. as a "probable human carcinogen"	"Both rats and hamsters exhibited dose-dependent increases in proliferation of pleural mesothelial cells following exposure to both fibre types (MMVF et RCF-1)." (Rutten et al., Fund Appl. Tox., 1994)
Magnesium sulfate fibre, calcium sulfate fibre and fibreglass		"it is suggested that some of man-made fibers have a greater ability than asbestos to induce tumor." (Adachi et al., Environ. Research, 1991)
Carbon / graphite fibre	- evidence of lung function deterioration in workers [1]	
Phosphate fibre	- intrapleural implantation in rats can induce fibrosarcomas [4]	
Attapulgite	- causes mesothelioma in experimental animals [7]	
Wollastonite	- evidence of lung fibrosis, pleural thickening and chronic bronchitis in humans [6]	

(1) ILO Safety in the use of mineral and sythetic fibres, 1989, p. 40
(2) IPCS Environmental Health Criteria 151, Selected Synthetic Organic Fibres, WHO, l993
(3) Saracci, R. et al.(1984) Brit J Ind Med. 41:425-436
(4) U.S. EPA, Status Report FTI-OTS-0386-0486, (1986)
(5) Davis, JMG et al.(1983), Biological effects of man-made mineral fibres, Euro Reports and Studies: 81:p. 124
(6) Huuskonen, M.S. et al.(1983) Environ. Res. 30:291-304
(7) Pott, F. et al.(1976) Ann. Anat. Pathol. 21:237-246

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