Radiation Stability of a Connecting Compound of the Electric Insulation of Superconducting Accelerator Magnets

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The strength limits of the samples of epoxy containing the fillers and antioxidants have been measured after γ-irradiation at dose rate of $10^{-1} \div 10^{2}$ Gy·s^{-1}. It is shown that different fillers, especially special cement, essentially increase radiation stability of the compound.

Using "Time-dose-temperature superposition" method and on the base of "Recognition Theory" the limiting doses, (see Table) corresponding to 25% losses of the yield strength (at electrical parameters conservation) were first determined by means of extrapolation to the dose rate of 10^{-3} Gy·s^{-1}. It is practically impossible to receive the value of the limiting dose in experiment for these conditions because it requires a very long time of irradiation of the samples to achieve necessary effect.

Compound	Dose rate, Gy·s^{-1}				
	$\leq 10^{-3}$	10^{-2}	10^{-1}	10^{0}	10^{1}
ED-22M	10^{5}	$2 \cdot 10^{5}$	$4 \cdot 10^{5}$	$1{,}2 \cdot 10^{6}$	$8 \cdot 10^{6}$
ED-22M + filler Al_2O_3	$3 \cdot 10^{5}$	$6 \cdot 10^{5}$	$1{,}2 \cdot 10^{6}$	$3{,}6 \cdot 10^{6}$	$9 \cdot 10^{6}$
ED-22M + antioxidant	$6 \cdot 10^{5}$	$1{,}2 \cdot 10^{6}$	$2{,}4 \cdot 10^{6}$	$7{,}2 \cdot 10^{6}$	$1 \cdot 10^{7}$
ED-22M + cement	$4 \cdot 10^{6}$	$8 \cdot 10^{6}$	$1{,}6 \cdot 10^{7}$	$6 \cdot 10^{7}$	$1{,}5 \cdot 10^{8}$

As the Table shows the most critical compound of the magnet coil is the epoxy (ED-22M).