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Mechanism of gamma-induced absorption bands formation at 665 nm in KS-4V and KI type quartz glasses.

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The pure quartz glasses of KS-4V type are one of the key materials for the optical diagnostics system of plasma in ITER. The goal of the experiment was determination of the nature and formation mechanism of the color centers with the optical absorption bands in the range of 660-680 nm, induced in quartz glasses of KS-4V and KI types with irradiating ⊠-quanta of 60Co at power 2.5 Gy/s, and temperatures 77, 273 и 310 K in the dose range 30 - 104 Gy. The band of 665 nm is more efficiently induced in the KI samples that contain more metallic impurities (<10 ppm), than the KS-4V (<0,1ppm). The studies of the stability induced in KS-4Vcenters shows that during period of 50 minutes at room temperature, 665 nm band is attenuated by about 50% and it is thermally stable at <300 K and at 323 K ≥ is fully annealed. Amount of destroyed joints of M-O-Si≡ with formation of the new unstable centers M+ ≡Al3+ O-–Si≡ with the band 665 nm at the radiation dose of 7.4×103 Gy increases to a maximum and then decreases due to radiation damage (instability). Gamma induced band of optical absorption in the glass of KS-4V type at 665 nm, along with well-known 550 and 620 nm, can lead to the distortion of diagnosable signals in visible transparency field in comparison with KU-1 type glass.

Author: Dr FAYZULLAEV, B.S. (Institute of Nuclear Physics Academy of Sciences of Uzbekistan, Tashkent 100214, Uzbekistan)

Co-authors: Dr ISLAMOV, A.Kh. (Institute of Nuclear Physics Academy of Sciences of Uzbekistan, Tashkent 100214, Uzbekistan); Dr NURITDINOV, I. (Institute of Nuclear Physics Academy of Sciences of Uzbekistan, Tashkent 100214, Uzbekistan)

Presenter: Dr FAYZULLAEV, B.S. (Institute of Nuclear Physics Academy of Sciences of Uzbekistan, Tashkent 100214, Uzbekistan)

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