

EPR INVESTIGATION ON THE POLYAMORPHIC TRANSFORMATION INDUCED BY ELECTRON IRRADIATION IN SiO₂ GLASS

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We report a study by electron paramagnetic resonance of amorphous silicon dioxide (a-SiO₂) irradiated by 2.5 MeV electrons in the dose range from 1.2×10^3 to 5×10^6 kGy. By measuring the change in the splitting of the primary ²⁹Si hyperfine doublet of the E_γ centers we evidenced an irradiation induced local (around the defects) densification of a-SiO₂. Our data show that the local degree of densification of the materials is significantly higher than that obtained by mean density measurements, suggesting that the structural modifications induced by electron irradiation take place prevalently within confined defective regions of the material.

The overall results we have found [1-4] have permitted us to obtain a detailed quantitative description of the electron irradiation-induced densification process of a-SiO₂ and to point out relevant physical properties which have for many years remained elusive. Among them, we have found strong evidences that the processes of permanent densification induced by irradiation or by high hydrostatic pressure involve quite similar structural modification of the a-SiO₂ matrix.

REFERENCES

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