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P3.194 Dielectric characterization of up to 0.1 dpa neutron irradiated insulating materials for fusion applications

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Functional materials have diverse applications in fusion reactors and it is clear that insulators are among the most versatile groups. They are the base of all the electric and radiofrequency systems in diagnostics and heating systems from DC to very high frequencies (RF, H&CD, NBI…). Additionally, insulators are subjected to quite different conditions (voltage, temperature, frequency…) depending on their application. In order to be a good candidate for dielectric applications, a material needs to be an excellent insulator at the required frequency, temperature and voltage. Furthermore, it has to exhibit exceptional radiation resistant behaviour because radiation levels can reach important levels for some in-vessel applications. Finally, reproducibility at industrial scale must be achieved for those materials to operate at a reactor level. In the European WPMAT-FM subproject, a set of samples acquired from different high-performance manufacturers have been subjected during 2017 and 2018 to various neutron irradiations to test their dielectric properties after neutron damage at higher doses than available in literature, to fill this gap.
We present pre-irradiation and PIE results coming from a neutron irradiation with 2 sets of dose and temperature specifications: an irradiation with a 0.9-1.0x1020n/cm2 dose at 260-290ºC and an irradiation with a 0.7x1020n/cm2 dose at 160-190ºC. These doses provide relevant data for both ITER and DEMO design parameters for many applications. Measurements include loss tangent and permittivity. Loss tangent is a key parameter to evaluate the power loss in the insulator (and hence its heating)

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