Determination of retained tritium from ILW dust particles in JET

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Quantitative analyses of retained tritium on dust particles produced from plasma facing walls are important issues for safe maintenances in ITER and DEMO. In JET, the ITER-Like Wall (JET-ILW) experiment is a real simulation of plasma facing materials towards ITER; hence, the understandings of produced amounts, deposited areas, tritium amount and irradiation level of dust particles are required.

The first campaign of the JET operation (19.5 h of plasmas in 2011-2012) with ILW was followed by the retrieval of selected in-vessel materials for detailed ex-situ studies [1]. The first observations of total retained tritium from dust particles were done for ILW dust particles using the combustion method in QST, Rokkasho Fusion Institute. For ILW dust particles, specific activities of 750 MBq/g at inner divertor and 5.9 MBq/g at the outer divertor were observed. For carbon wall dust particles, specific activities of 5.5 MBq/g at inner divertor, 3.3 GBq/g at in/out louvres and 100 MBq/g at the outer divertor were observed.

The specific tritium activity of ILW dust is similar to dust from the carbon wall, however the total activity due to dust in the ILW is two orders of magnitude lower than that in carbon wall. This is due to a decrease in dust production greater than two orders of magnitude in the ILW (<2 g) compared with the carbon wall (>200 g). Carbon dust particles in the ILW dust samples have been shown to contain the highest amounts of fuel compared with beryllium and tungsten based particles. Such carbon particles are likely to be those remaining from the carbon wall era and probably account for the high specific activity of the ILW dust sample [2]. However there is evidence of impurity mixing with beryllium and tungsten dust particles [3-4] which will affect retention in dust. Further statistical analysis is required to evaluate the extent to which mixed material dust particles contribute to overall fuel retention.

[1] A. Widdowson et al., Phys. Scr. T159 (2014) 014010.
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[3] N. Ashikawa, N. Asakura, et al., IAEA FEC (2016) EX P6-19.
[4] M. Rubel, et al., ISFNT, Kyoto (2017).

**See author list in the paper, X. Litaudon et al., Nucl. Fusion, 57 (2017) 102001.*