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## 3D Tritium Transport Model at Breeder Unit Level for WCLL Breeding Blanket

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The Water-Cooled Lithium Lead (WCLL) Breeding Blankets is one of the European blanket designs proposed for DEMO reactor. A tritium transport model inside the blankets is necessary to assess their preliminary design and safety features. Tritium transport and permeation are complex phenomena to be taken into account in the evaluation of tritium balance in order to guarantee tritium self-sufficiency and to characterise tritium concentrations, inventories and losses. In this context, the study has been performed at breeder unit level in the outboard equatorial breeding blanket module, which is, during the normal operating conditions, one of the most loaded modules and this results in higher permeation phenomena. For these purposes, a 3D transport model has been investigated; the model includes buoyancy effects and a preliminary evaluation of the magneto-hydro-dynamics effect (MHD) is also performed. Moreover, it includes advection-diffusion of tritium into the lead-lithium eutectic alloy, transfer of tritium from the liquid interface towards the steel (adsorption/desorption), diffusion of tritium inside the steel, transfer of tritium from the steel towards the coolant (recombination/desorption), advection-diffusion of diatomic tritium into the coolant and buoyancy effect. The temperature profile, tritium generation rate profile, and Pb-15.7Li flow velocity profile have been also taken into account. Results deriving from the transport equation solution, with the above specified phenomena, input and boundary conditions are illustrated in detail within the paper.

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