ITER First Wall (FW) panels are the innermost part of the ITER reactor. Metallic materials used for their manufacture are 316L(N)-IG stainless steel, a copper alloy and beryllium. Stainless steel material is a support structure for the copper alloy that serves as a heat sink material and also for the beryllium tiles that are a protective armour against the plasma. All these materials are bonded together by Hot Isostatic Pressing (HIP). Thus, several types of joints (Cu/Cu, SS/SS or Cu/Be) are present in a FW panels.

Their manufacturing requires a very strict and advanced metallic surface preparation in order to eliminate most of the organic or oxide layers that could prevent the diffusion process between the facing materials. In this field, our laboratory practice enables to obtain sufficiently clean metallic surfaces and high strength joints are obtained when small mockups are made. However, the manufacture of a large number of FW panels in the future requires to find a new cleaning process that is industrially relevant without a strong reduction of the joint’s mechanical properties.

In this paper we present our investigations to find an industrial solution to clean efficiently copper alloy and stainless steel materials in order to manufacture high strength Cu/Cu, SS/SS or Cu/SS joints. Products investigated are mainly acid liquids proposed by chemical Company and a more advanced technique that uses a plasma process. HIP joints are tested mechanically by making impact toughness and tensile measurements. Results obtained with these solutions are compared to those obtained in our Laboratory by using our own cleaning route. Moreover, XPS analyses are performed on small specimens that have been submitted to the same cleaning treatments in order to better understand the mechanical results of our specimens.