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### The St707 Alloy

The St707 wide operating temperature range from  $-20^{\circ}\text{C}$  ( $0^{\circ}\text{F}$ ) to  $700^{\circ}\text{C}$  ( $1200^{\circ}\text{F}$ ) and its availability in different formats make this alloy the best solution for Vacuum Insulated Tubing.

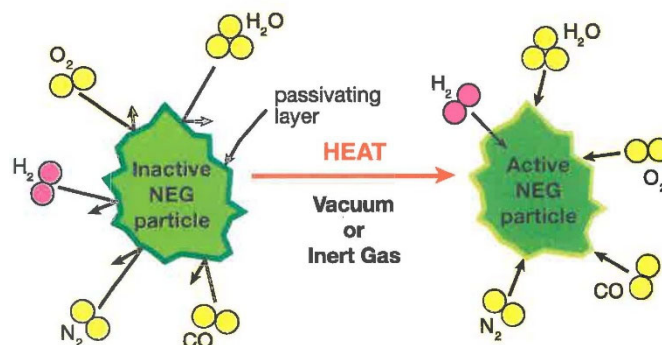
The St707 getter material is a ternary alloy with the following nominal composition:

Zirconium	70%
Vanadium	24.6%
Iron	5.4%

### St707 Getter Activation

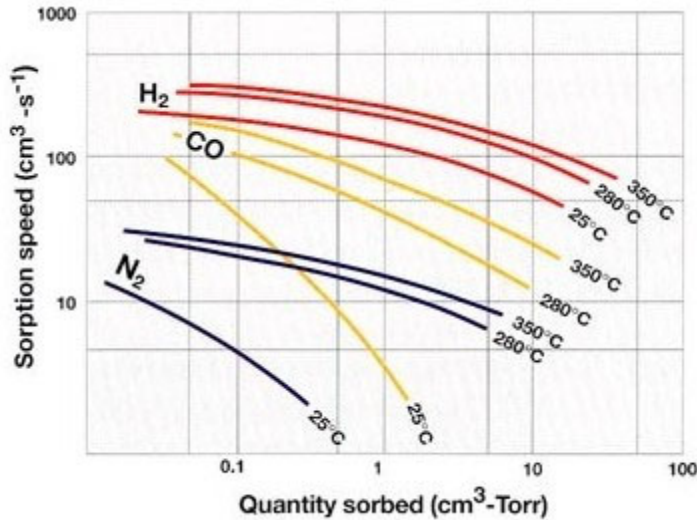
The St707 getters have a protective passivation layer created during its manufacture. The Getter alloy is manufactured by melting and mixing the various components and letting the alloy cool to ambient room temperature. During this cooling process the alloy, having an affinity to sorb gases, attracts gas molecules so rapidly that this bulk of gas molecules it's the Getter surface creating a surface passivation layer prohibiting gases from being sorbed into the Getter interior.

Activation of Getter must be in a partial vacuum (the higher the vacuum the better) at a prescribed temperature of  $400$  to  $500^{\circ}\text{C}$  ( $755$  to  $935^{\circ}\text{F}$ ) for a minimum of 10-minutes to cause the passivation layer to be sorbed into the Getter, opening the face of the Getter to sorb gases that remain within the annulus space between the inner and outer tubes of the VIT joint after bake-out. This process is called "Temperature Controlled Desorption Process", see OTSI document "Temperature Programmed Desorption Process" (Bake-out Process).



### St707 Getter Operation

Once the alloy is activated, reactive molecules such as  $\text{O}_2$ ,  $\text{H}_2\text{O}$ ,  $\text{N}_2$ ,  $\text{CO}$ ,  $\text{CO}_2$  and  $\text{H}_2$  are sorbed via a three steps adsorption mechanism: surface dissociation, surface sorption and bulk diffusion. Hydrocarbons are adsorbed at lower pumping speed at temperatures above  $200^{\circ}\text{C}$ .



Once adsorbed, oxygen, nitrogen and carbon atoms cannot be released by the St707 due to the formation of strong chemical bonds with the alloy atoms.

Hydrogen reacts differently: it diffuses into the St707 getter bulk even more quickly than the other species and it distributes uniformly within the bulk even at low temperatures. However, since the bonds hydrogen-alloy are weak, some of the hydrogen sorbed at low temperatures can be released at higher temperature.

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