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RESEARCH ON COMPOSITE HIGH-PRESSURE VESSEL TECHNOLOGY APPLICABLE FOR SPACE SYSTEM

Abstract

On the requirement of composite vessels for space fields, a kind of composite helium vessel is designed explicitly. Researches on high-performance resin matrix, composite forming technology of light-weight high-pressure vessel with thin-wall metal liner and composites/liner deformation and consistency technology are developed detailed. The burst pressure of vessel is no less than 60MPa. The weight of composite layers is no more than 6.5kg. The performance ratio is no less than 30km. In this paper it is designed by using grid theory. The composite layers are made of carbon fiber and epoxy resin. After the study, the key processing parameters such as the thickness of liner, spiral fiber layer and hoop fiber layer, winding angle, fiber pre-tention, fiber volume content and etc. are obtained optimally. Moreover the curing process is optimized. Based on these optimal parameters, numbers of composite vessels are manufactured. Through analysis and calculation with critical buckling load of liner, influences of fiber pre-tention on thin-wall metal liner is resolved, gaining the liner's stiffness-keeping technique. A series of tests are carried out for composite vessel performance evaluation. In conclusion, the composite vessels studied in this paper meet the design requirements. It can highly lighten structure weight of vessels for space fields, establishing a technical foundation for composite vessels application for space fields.