A novel sol-gel coating impregnated with filter dust was applied on chemically bonded sand core materials by dipping. After curing, the strengths of the core materials were measured under uniaxial loading using a new strength testing machine (STM). The STM presents the loading history as a force-displacement curve from which the mechanical properties of the materials are deduced. The fracture surfaces were examined using a stereomicroscope and a scanning electron microscope. From the results, the strengths of the core materials were slightly reduced by the coating in tensile and flexural modes, while the strengths were increased under compression. The mode of fracture of the chemically bonded sand core materials was observed to be intergranular through the binder. The stiffness of the chemically bonded sand core materials was determined. For better understanding of the mechanical properties of the chemically bonded sand core materials, a combination of flexural and compression tests is suggested for improving the casting quality. © 2012 W. S. Maney & Son Ltd.