

A method (100) for producing a particulate titanium alloy product can include preparing (110) a composite particulate oxide mixture with TiO_2 powder and at least one alloying element powder. The composite particulate oxide mixture can be co-reduced (120) using a metallic reducing agent under a hydrogen atmosphere at a reduction temperature for a reduction time sufficient to produce a hydrogenated titanium alloy product. The hydrogenated titanium alloy product can then be heat treated (130) under a hydrogen atmosphere and a heat treating temperature to reduce pore size and specific surface area to form a heat treated hydrogenated titanium product. The heat treated hydrogenated titanium product can be deoxygenated (140) to reduce residual oxygen to less than 0.2 wt% to form a deoxygenated hydrogenated titanium product as a particulate. The deoxygenated hydrogenated titanium product can optionally be dehydrogenated (150) to form the titanium alloy product as a particulate.