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## Thermodynamic analysis of oxygen refining during electron-beam additive manufacturing of pure titanium products

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### Abstract

Chemical composition of pure titanium, particularly oxygen, severely affects mechanical properties of product. Oxygen refining during electron-beam additive manufacturing (EBAM) of pure titanium products was thermodynamically analyzed. The oxygen concentration of the titanium sample fabricated by EBAM was 0.172%, which was lower than that of the initial titanium powders (0.228%). This was mainly because the TiO<sub>2</sub> native oxide layer formed on the initial powders reduced during EBAM, thereby decreasing the oxygen concentration. Analysis of temperature and oxygen partial pressure in the EBAM building chamber confirmed the occurrence of reduction and hence the oxygen refining effect.

Keywords : Titanium; Electron beam additive manufacturing; Oxygen refining; Oxygen concentration

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