form a surface layer consisting only of intermetallic phase dendrites with the size up to 4 μm after CPF treatment at Q=7 J/cm^2 (Fig. 4b).

a)

b)

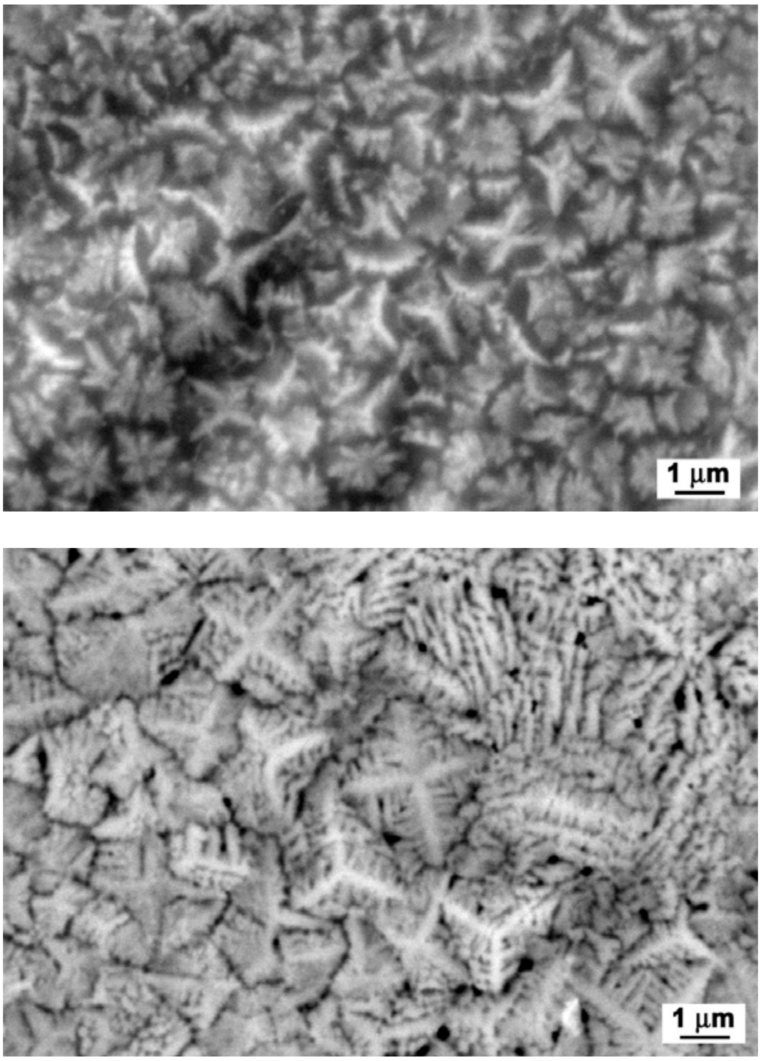

Fig. 4 Cross-section morphology of the Ti (2.5 μm) /silumin system (a) and Ti (5.5 μm) /silumin system samples after CPF treatment with the energy density of 19 J/cm^2 (a) and 7 J/cm^2 (b).

The microhardness tests showed that CPF treatment resulted in the surface microhardness increase from 1.3 GPa (for the initial silumin sample) to 2.2 GPa (for the Ti (2.5 μm) / silumin system sample treated at Q=19 J/cm^2) and to 4.4 GPa (for the Ti (5.5 μm) / silumin system sample treated at Q=7 J/cm^2). The latter value lies in the range attributed to microhardness of bulk Al_3Ti, which agrees with the data of SEM investigations (Fig. 4b).

The results of this work demonstrate that compression plasma flows treatment of Ti pre-coated silumin samples allows to form a surface composite layer with the thickness up to 60 μm reinforced by $(Al,Si)_3Ti$ intermetallic particles. The size of intermetallic precipitates (mainly dendritic-like) varies in the range of 0.2 – 4 micrometers depending on treatment parameters and Ti coating thickness. Plasma treatment also results in dissolution of primary silicon crystals and formation of a Al(Si) supersaturated substitutional solid solution. The change of treatment parameters and Ti coating thickness allows to control Ti atoms concentration and volume fraction of reinforced particles providing a substantial microhardness increase up to 4.4 GPa.