The change of saturation magnetization in boronized low carbon microalloyed steels was investigated as a function of boronizing time. Specimens were boronized in an electrical resistance furnace for times ranging from 3 to 9 h at 1123 K. The metallurgical and magnetic properties of the specimens were investigated using optical microscopy (OM), scanning electron microscopy (SEM), X-ray diffraction (XRD) and vibrating sample magnetometry (VSM). A boride layer with saw-tooth morphology consisting of FeB and Fe2B was observed on the surface, its thickness ranged from 63 µm to 140 µm depending on the boronizing time. XRD confirmed the presence of Fe2B and FeB on the surface. The saturation magnetization decreased with increasing boronizing time. This decrease was attributed to the increased thickness of the FeB and Fe2B phases. Cracks were observed at the FeB/Fe2B interfaces of the samples. The number of interfacial cracks increased with increasing boronizing time.