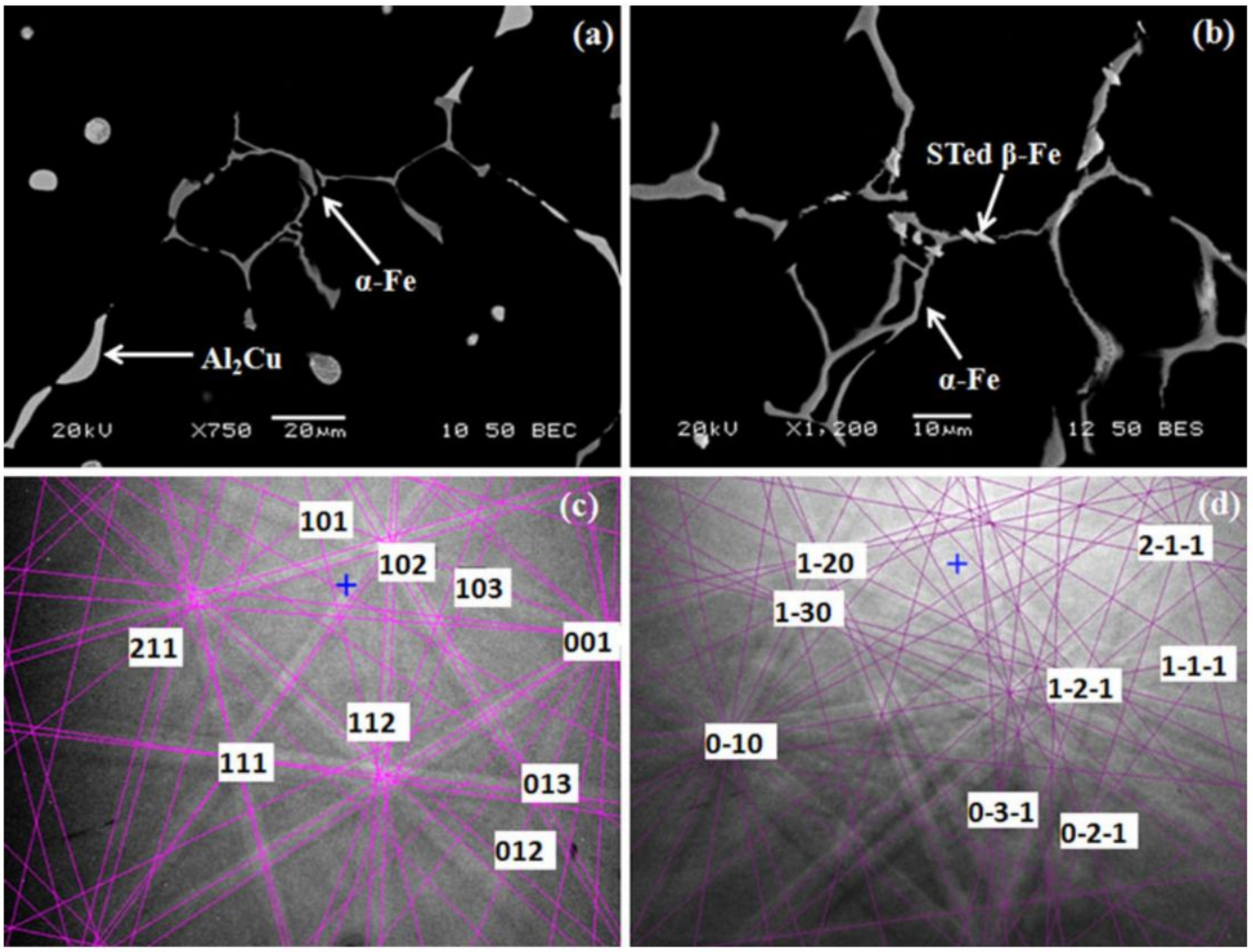

Fig. 2—Microstructures of alloy B in (*a*) as-cast and (*b*) SHTed (8 h) conditions; and EBSD results of (*c*) α-Fe in (b) and (*d*) STed *β*-Fe in (b).

Table II. Chemical Compositions of Iron-Rich Intermetallics in the As-Cast and SHTed Conditions

		Elements (Wt Pct)				
Conditions	Iron-Rich Intermetallics	Al	Si	Mn	Fe	Cu
As-cast	α-Fe	70.92 ± 0.76	7.8 ± 0.35	3.15 ± 0.25	13.21 ± 0.42	4.91 ± 0.24
	β-Fe	70.28 ± 0.67	0	1.57 ± 0.21	7.51 ± 0.31	20.64 ± 0.58
SHTed (8 h)	α-Fe	74.43 ± 0.82	6.68 ± 0.46	3.54 ± 0.31	9.92 ± 0.23	5.43 ± 0.31
	STed *β*-Fe	75.10 ± 0.85	0	1.42 ± 0.12	7.27 ± 0.25	16.21 ± 0.56

contents of Mn and Si, which is consistent with the literature.[16,30] After being SHTed for 8 hours, almost the entire amount of Al_2Cu is dissolved into the Al matrix as shown in Figure 2(b). It is also interesting to note that the Chinese script α-Fe phase becomes unstable and is transformed into a small amount of short intermetallic platelets, leading to the fragmentation of the α-Fe.

The chemical compositions of the iron-rich intermetallics in Alloy B in the as-cast and SHTed (for 8 hours) conditions measured by SEM–EDS are shown in Table II. It can be found that higher Al contents are detected in the α-Fe and STed *β*-Fe after SHT than the corresponding iron-rich phases solidified directly from the liquid. This can be attributed to the partial contribution of the surrounding Al matrix due to the small sizes of the fragmented α-Fe and STed *β*-Fe particles after SHT. Compared with the as-cast condition, it can be found that the iron content in α-Fe is reduced after SHT for 8 hours. As shown in Figure 2(c), however, the EBSD results with a mean angular deviation (MAD) of 0.452, lower than 0.7 which is considered to be critical for an accurate solution,[31] indicate that this phase is still the α-Fe (body-centered cubic with *a*, *b*, and *c* as 1.265 nm[11]). Moreover, the platelet-like intermetallic phase formed during the SHT has a similar chemical composition to the *β*-Fe obtained in the as-cast condition (Table II) and thus is termed as solid-state-transformed *β*-Fe (STed *β*-Fe) to distinguish it from the *β*-Fe directly precipitated from liquid metal during solidification. The formation of the STed *β*-Fe is further confirmed a low MAD value of 0.258 as measured by EBSD (Figure 2(d)), The STed *β*-Fe is most likely to have the same crystal structure as the solidified *β*-Fe (tetragonal with a and b of 0.634 nm and c of 1.488 nm[11]) due to their similar diffraction patterns. However, the STed *β*-Fe has lower Cu content than the *β*-Fe (Table II), and the replacement of the Cu by Al