Supplementary Materials

Analysis of dislocations in figure 6

A contrast analysis has been performed on dislocations presented in figure 1a. Both d_1 and d_2 are visible with $\vec{g} = (10\bar{1}3)$ and with $\vec{g} = (\bar{1}01\bar{1})$. Invisibility of the dislocations d_1 with $\vec{g} = (\bar{1}\bar{1}20)$ and its faint residual contrast with $\vec{g} = (\bar{1}010)$, lead to a Burgers vector $\vec{b}_{d_1} \| \langle c \rangle$ direction. Invisibility of the dislocations d_2 with $\vec{g} = (1\bar{1}02)$ and with $\vec{g} = (\bar{1}10\bar{1})$, leads to a Burgers vector $\vec{b}_{d_2} \| [11\bar{2}0]$, i.e. along the $\langle a \rangle$ direction. The Burgers vectors and invisibility conditions are reported in the stereographic projection in Fig. 1b.

The dislocation habit plane can be determined by using the variation of the dislocation apparent width w (Fig. 1c) during a tilt series. The analysis shows that both types of dislocations present the same variation of their apparent width. The normalized width w/w_{max}, with respect to the tilt angle (dots) is reported in figure 1c. The points can be accurately fitted by the full curve representing the theoretical variation of the width of dislocations that are located in the basal plane.

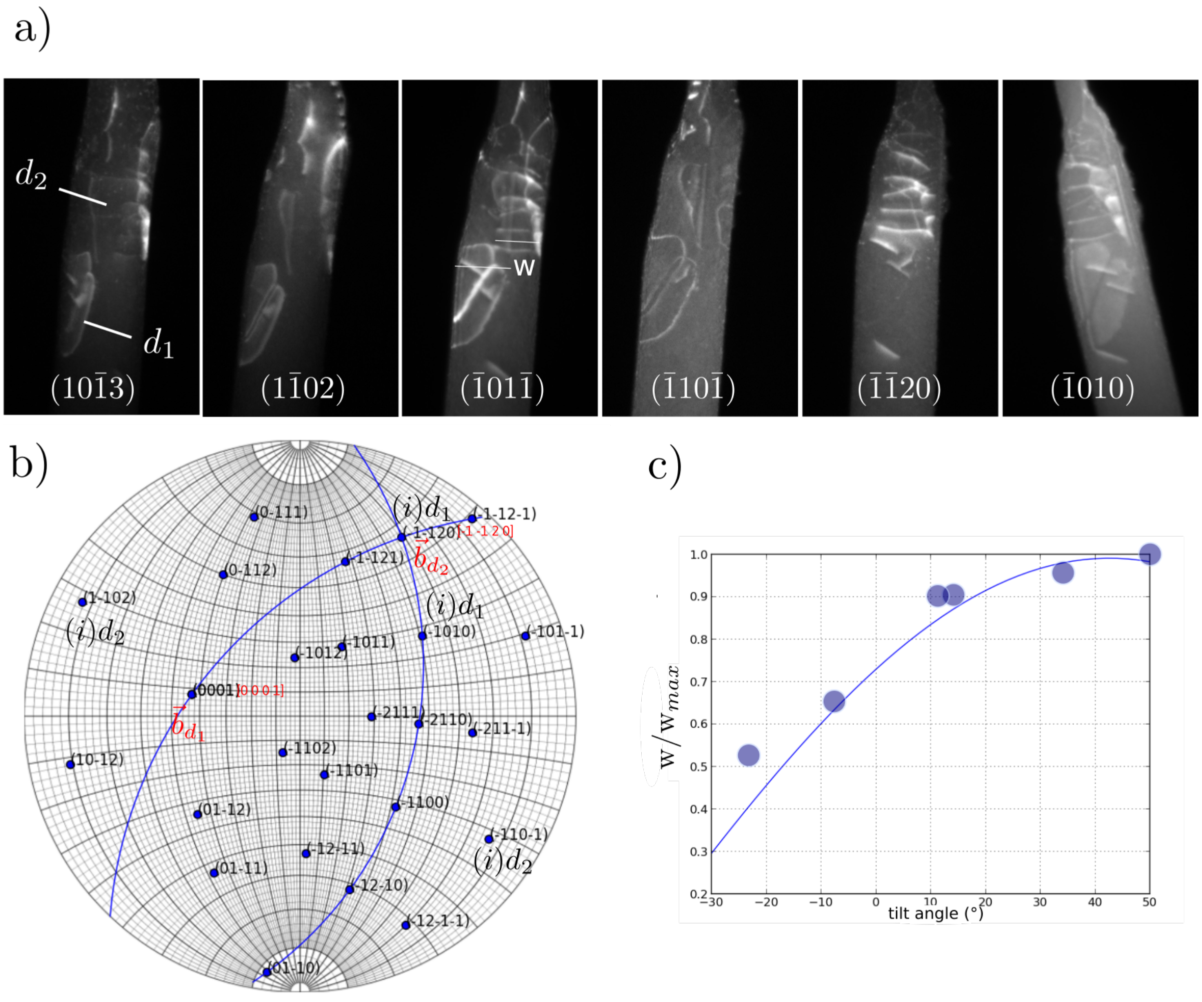

Figure 1: a) Analysis of the contrast of dislocations d_1 and d_2 in dark field mode . b) is the stereographic projection of the wire. c) is the theoretical variation of the apparent dislocation width with the tilt angle in the basal plane and experimental measurements (dots).

Analysis of the interfacial dislocations in figure 8

A contrast analysis, of interfacial dislocations between Al and Be, based on the method described by Marukawa et al. [1], was performed for a collection of two beam bright field images taken with 10 diffraction vectors $\vec{g}$. It is shown in figure 2.

The asymmetric dark(D)/light(L) contrasts at the two sides of the dislocations with respect to the dislocation line oriented from the bottom to the top of the interface indicates that $\vec{g}_i \cdot \vec{b} < 0$ for $i = 1, 3, 4, 8$, $\vec{g}_j \cdot \vec{b} > 0$ for $j = 5, 6, 7$. These conditions restrict the location of the Burgers vector in the colored area in figure 2. Additional faint residual contrasts corresponding to $\vec{g}_k \cdot \vec{b} \approx 0$ are obtained for $k = 2, 9, 10$. This indicates that $\vec{b}$ is close to [001] direction in Al and [$\bar{1}$010] in Be. The Burgers vector is thus normal to the interface plane.

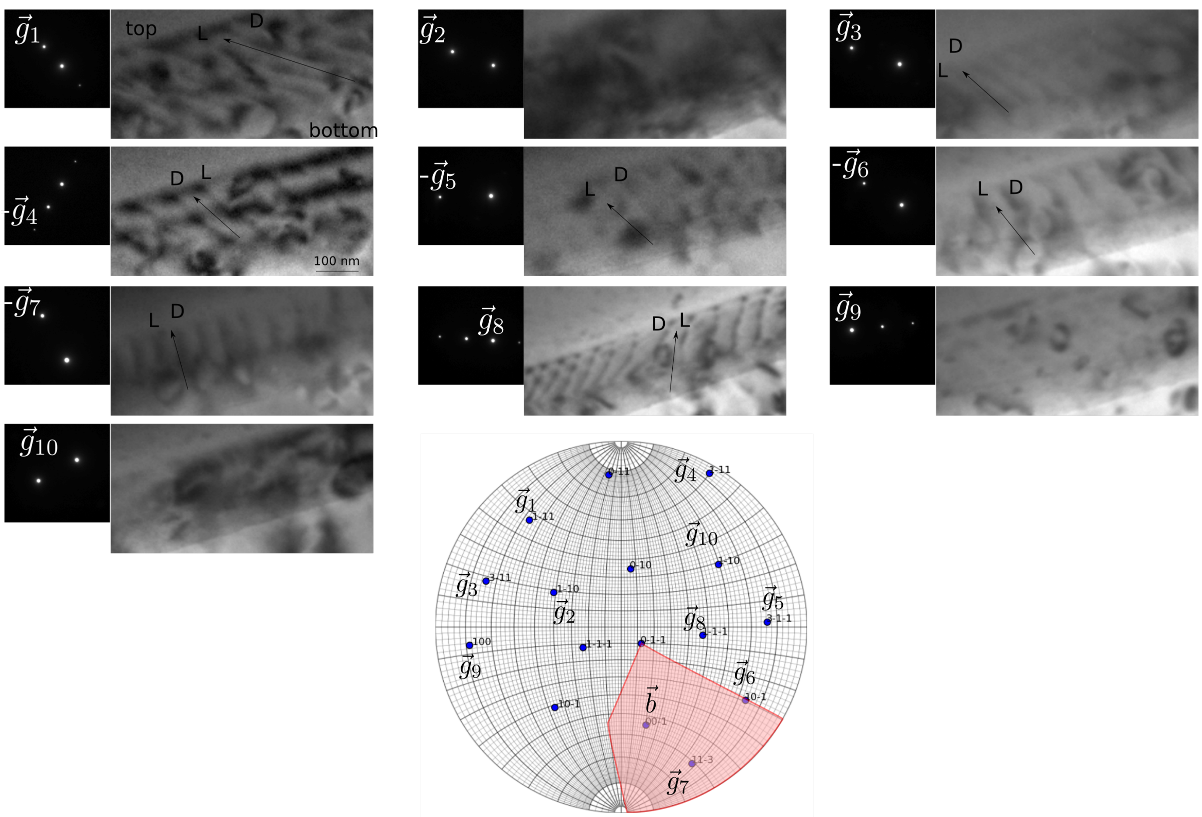

Figure 2: Interfacial dislocation contrast analysis. When $\vec{g} \cdot \vec{b} < 0$ ($\vec{g} \cdot \vec{b} > 0$), the dislocation contrast is asymmetrical with a light (dark) and dark (light) contrast along the line when oriented from the bottom to the top surface. When $\vec{g} \cdot \vec{b} \approx 0$, the dislocation has a faint contrast. The different conditions lead to a Burgers vector located in a colored area in the stereographic projection, presumably close to the [001] direction.

References

[1] K. Marukawa, Y. Matsubara, Trans. Jap. Inst. Metals 20 (1979) 560–568.