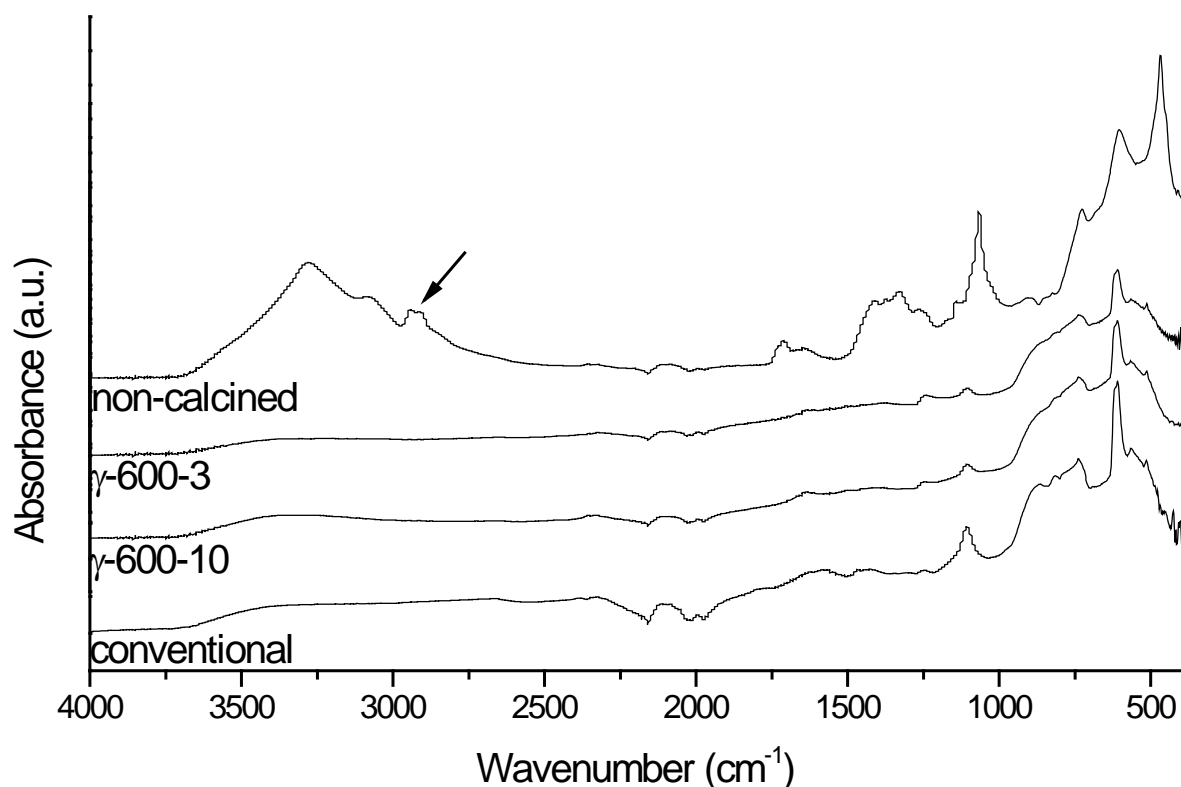


## Supplementary information

To verify whether PVA had debinded from the calcined boehmite layers, infrared analysis was performed on calcined  $\gamma$ -alumina. The layers were dip coated onto wafers, and further treated as described in section 2.3 of the main article.

Attenuated Total Reflection (ATR) infrared spectra were recorded on a Nicolet 6700 FT-IR (Thermo Scientific) equipped with a Smart Orbit accessory with diamond crystal for ATR FT-IR. Figure S1 shows the infrared spectra of a non-calcined layer of boehmite and layers of boehmite calcined at 600 °C for 3 minutes ( $\gamma$ -600-3) and ( $\gamma$ -600-10). A conventionally calcined layer is provided as reference.

The non-calcined layer show a clear OH-peak (3000-3500) region, originating from water and alcohol groups in the structure, and a distinct C-H signal (around 2900) from the PVA carbon backbone. For all calcined samples, this C-H peak has completely disappeared. The OH-peak decreased from a strong signal to a weak, broad signal, coming from OH-groups in the  $\gamma$ -alumina structure. The peaks at low wavenumbers indicate the transformation from boehmite to  $\gamma$ -alumina.



**Figure S1: Infrared spectra of a non-calcined, a conventionally calcined, and boehmite layers rapidly calcined for 3 and 10 minutes using the hot environment method. The arrow indicates the C-H bonds that are visible only for the non-calcined layer.**