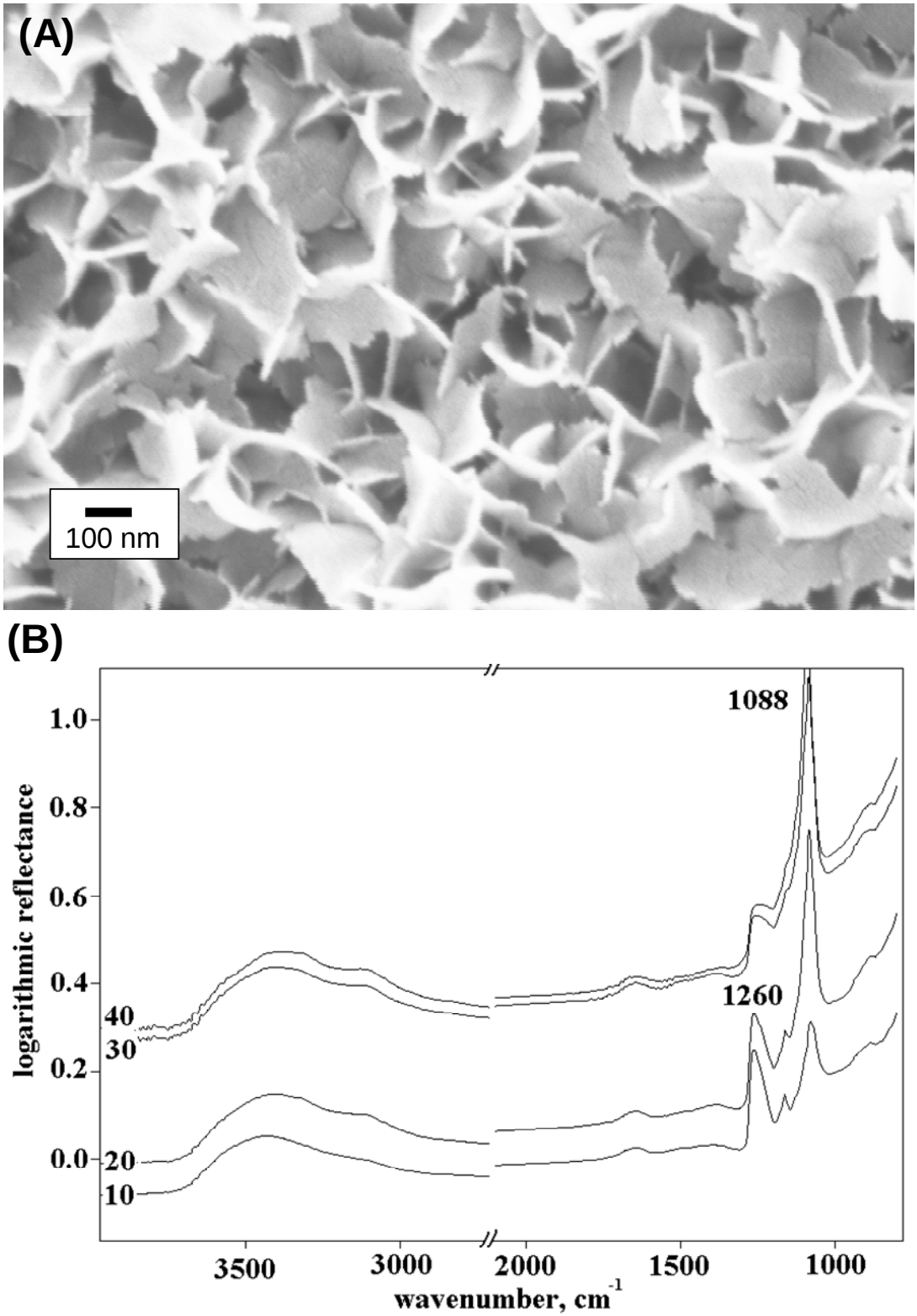
Supplementary information.

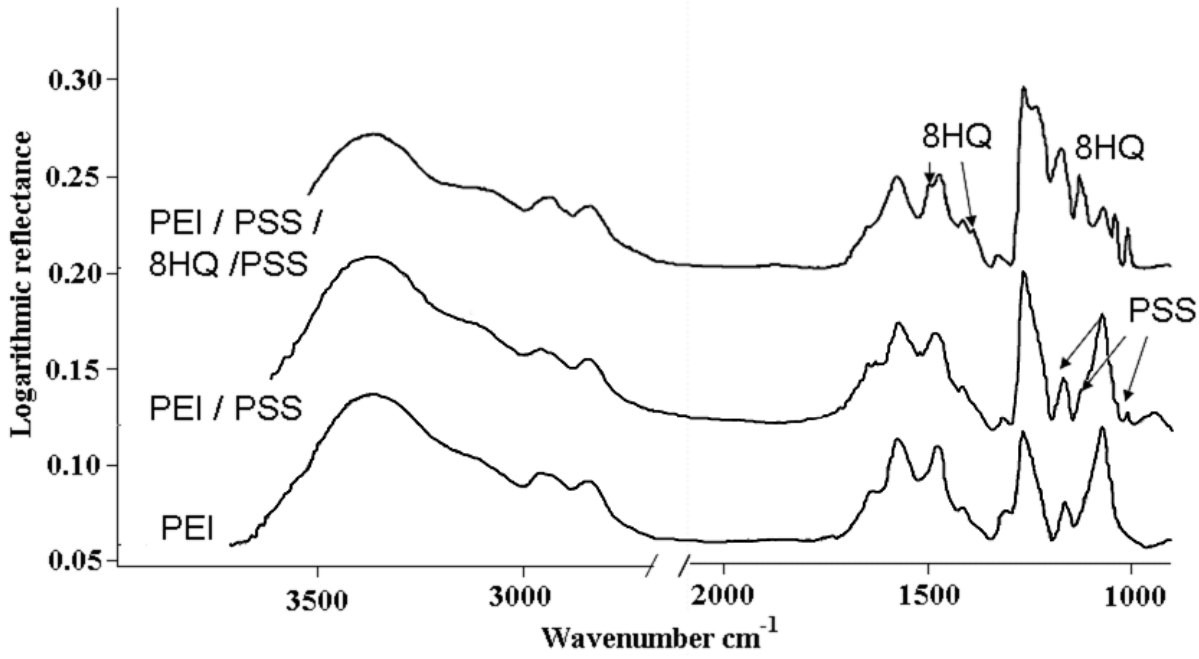
1. Formation of the porous aluminum oxide layer by sonication.



Supplementary figure S1. SEM image of the aluminium alloy surface after sonication for 10 min (a); IRRA spectra of the Al plates with different time of sonication (10, 20, 30 and 40 min) (b).

2. Deposition of polyelectrolytes and inhibitor.

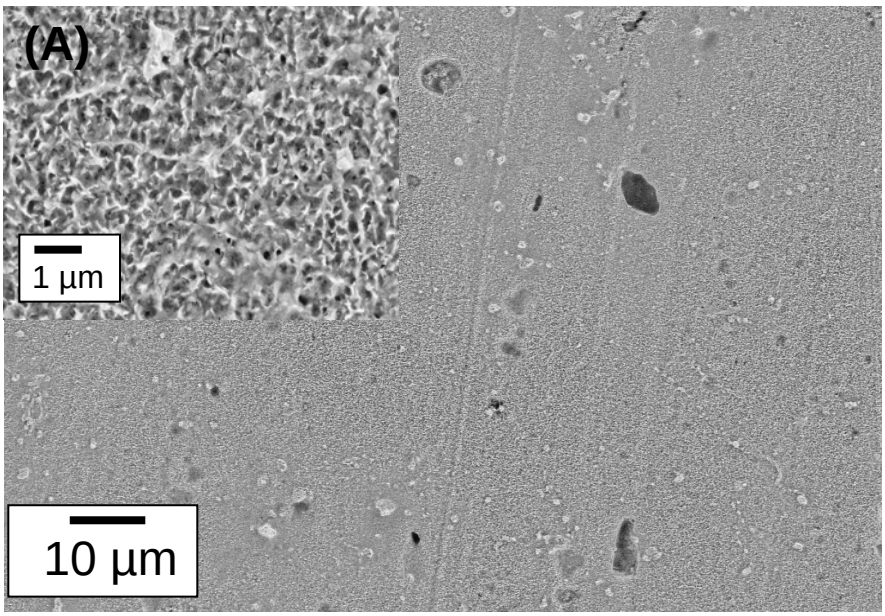
Layers of polyelectrolytes and inhibitor were formed on freshly sonicated aluminium alloys by spray drying in layer-by-layer fashion. As shown in Figure S2, the formed LBL film is characterized by infrared adsorption bands which can be assigned to all film components. The IRRA spectrum of PEI (Fig. S2) contains two bands at 2930 and 2820 cm^{-1} resulting from the CH stretching vibrations of the methylene groups of the polymer. A broad peak with a maximum around 3300 cm^{-1} and a 3250 cm^{-1} shoulder can be attributed to the NH stretching band. It may be assumed that the shoulder at 3250 cm^{-1} corresponds to the hydrogen bonding of the NH... O type in complexes between PEI film and aluminium oxide. The decrease in the frequencies of the valence vibrations of the N-H bond in the complex indicates an enhancement in its polarity and, consequently, an increase in the acid properties of the proton. The characteristic bands from both PSS and HQ could be also distinguished in the spectrum. The SO_3^{2-} antisymmetric and symmetric vibrational adsorptions are assigned to the peaks at 1184 and 1042 cm^{-1}, respectively. Peaks at 1130 and 1011 cm^{-1} can be assigned to the in-plane skeleton vibration of the benzene ring and in-plane bending vibration of the benzene ring. The bands at 1606, 1506, 1498 and 1475 cm^{-1} can be assigned to ring vibrations and the one at 1373 cm^{-1} to C-H bending of the >CHO group in the 8HQ molecules[20]. Therefore, the all components of the coating were successfully deposited on the metal substrate. The hydrogen bond interactions between PEI and oxide layer of the aluminium alloy as well as mechanical overlapping provide tight contact between the coating and the substrate.

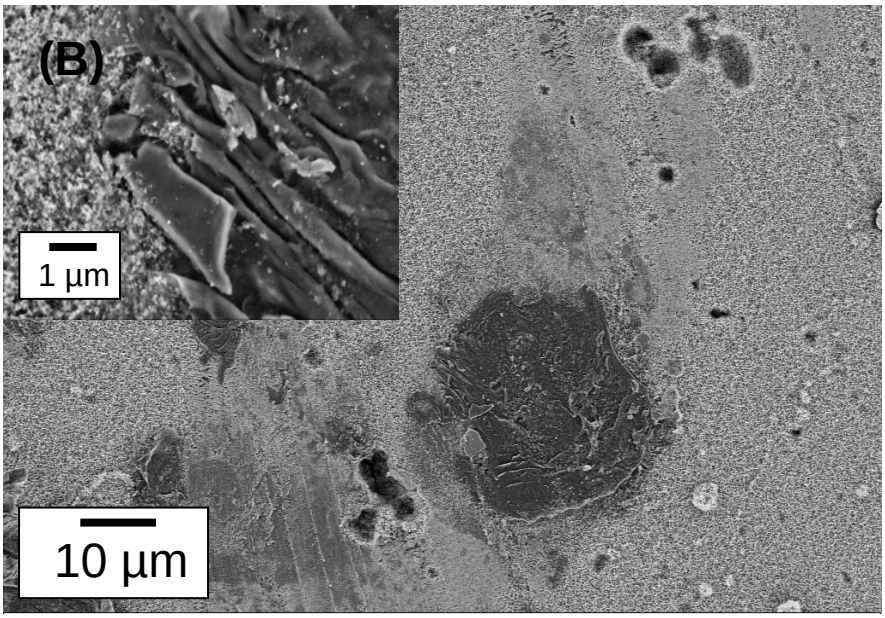


Supplementary figure S2 . IRRA spectra of the aluminum alloy covered by polyelectrolyte / inhibitor coating on each stage of the modification.

3. SEM proofs of the corrosion suppression by the polyelectrolyte / inhibitor coating

The corrosion suppression is also proved by SEM images shown in Fig. S3A. The SEM image of the aluminum surface covered by the polymer / inhibitor multilayer reveals no traces of corrosion degradation. The corrosion pits formed in the unmodified Al plates can be clearly observed in the SEM images (Fig. S3B).





Supplementary figure S3. SEM images of the covered aluminium alloy (A) and the unmodified aluminium alloy after 16 hr immersion in 0.1 M NaCl (B).