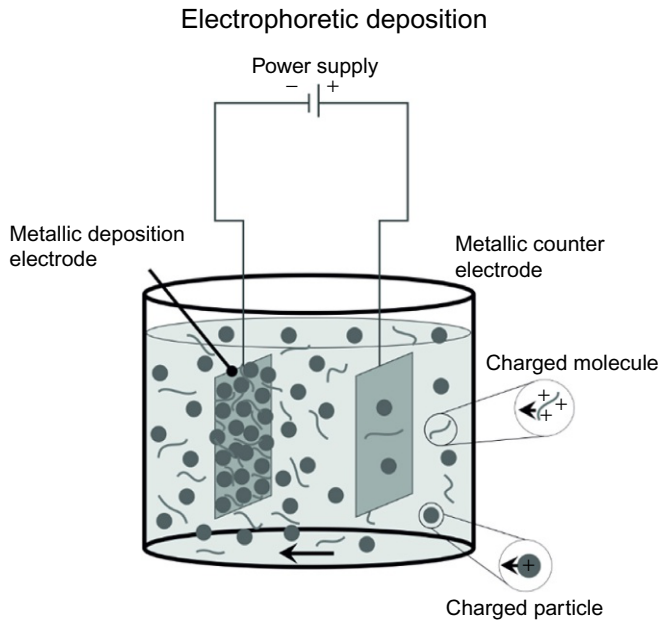

FIG. 1.1 Basic set-up of the EPD cell. *(Reproduced with permission from Heise, S., Virtanen, S., Boccaccini, A.R., 2016. Tackling Mg alloy corrosion by natural polymer coatings—a review. J. Biomed. Mater. Res. Part A 104, 2628–2641 of John Wiley and Sons.)*

interest in EPD to develop coatings is ever increasing due to the high versatility of the technique, which can be used for ceramics, glasses, metals, polymers and their composites, and for developing functional, nanostructured, layered, and graded materials (Boccaccini et al., 2010; Neirinck et al., 2013; Amrollahi et al., 2015). Especially in the biomaterials sector, the deposition of thin films and the coating of porous materials like scaffolds with bioactive layers, particles with drug-delivery ability, and biological entities is of high interest (Boccaccini et al., 2010; Roether et al., 2002; Seuss and Boccaccini, 2013). Further advantages of EPD are the possibility to homogeneously deposit materials at room temperature and the requirement of rather simple and cost-effective equipment leading to coatings with controllable thickness. EPD has also the ability to be scaled up to large product sizes (Boccaccini et al., 2010).

The surface charge of solid particles in suspension can occur by different mechanisms: (Van der Biest and Vandeperre, 1999)

(1) Dissociation of ions from the particles into the solution
(2) Selective adsorption of potential-determining ions
(3) Adsorption or orientation of dipolar molecules
(4) Electron transfer between the particle and the electrolyte due to differences in work function