An optimum method is proposed to prepare thin foil transmission electron microscopy (TEM) lamellae of multiphase porous functional ceramics: prefilling the pore space of these materials with an epoxy resin prior to focused ion beam milling. Several advantages of epoxy impregnation are demonstrated by successful preparation of TEM specimens that maintain the structural integrity of the entire lamella. Feasibility of the TEM alignment procedure is demonstrated, and ideal TEM analyses are illustrated on solid oxide fuel cell and solid oxide electrolysis cell materials. Some potential drawbacks of the TEM specimen preparation method are listed for other samples.