A non-oxidizing electrode arrangement for an excimer lamp that is formed by coating an electrode of the lamp with a layer of protective layer that prevents the electrode from oxidizing. The protective layer is preferably transparent and possesses a low permeability for oxygen (e.g., silicon oxide, magnesium fluoride, calcium fluoride). The interior of the excimer lamp is evacuated to a pressure level that is lower than the pressure level surrounding the excimer lamp at any time during the non-oxidizing electrode formation process in order to assist in preventing the excimer lamp from fracturing.