The Refractance Window™ (RW) is a drying process that preserves the sensory and nutritional properties of foods. The product to be dried is spread on a polyester mat (Mylar®), transparent to infrared radiation, which floats on a bath water at 95-98 °C. A solution (e.g., fruit pulp) is spread over the mat, and absorbs the infrared radiation from the hot water. In addition, heat is conducted through the plastic mat to the solution. The literature presents a few data on the relative importance of the heat transfer mechanisms during drying. This study evaluated the drying kinetics of tomato pulp (Solanum lycopersicum) using a prototype of RW operating in batch, with a Mylar® film of 0.25 mm. Besides, drying experiments were performed with the film painted in black, in order to block the radiation. The water temperatures were 75, 85 and 95 °C and the thicknesses of spread tomato paste were 2 mm and 3 mm. It was observed that under the same experimental conditions the drying time using the black film was twice that observed for the transparent film. This result suggests that the contribution of radiation on drying was 50%. The shorter drying time was 14 minutes, for the 2 mm thick pulp, using water at 95 °C. It was observed that the pulp thickness had a greater influence on the drying time than the water temperature. The dehydrated tomato could be easily rehydrated, indicating that the RW is a viable alternative to produce dehydrated tomato pulp.