HV) almost equal to microhardness (1680 ± 250 HV) of relatively thick coating (≈ 80 μm) obtained under the same conditions but without additional external heating of a substrate. However the increasing temperature of oil circulating through the tubular samples causes the same effects of the PEO coating formed on the outer surface of tubes as the increasing value of parameter R. Obviously the increase of substrate temperature as well as the increase of R value lead to the heating of inner part of coating that results in higher amount of high-temperature modification of alumina, particularly of corundum (α-alumina). We have proposed that a coating heating is mainly contributed by 1) Joule heat and 2) low porosity of coating.

Beyond all doubt the research of temperature of microdischarges occurred on the sample surface during PEO process is of the highest scientific interest. However if the temperature of discharges overtops the melting temperature of alumina the further increase of it does not significantly accelerate α-alumina formation in the PEO coating. According to the literature data the temperature of the discharge area lies in a range from 2500 till 20000 °C, i.e. depending on time during which the parts of coating are heated up to these temperatures different amount of α-alumina can be revealed in the coating.

On the basis of our research we have suggested that in case of details the obtaining of relatively thin (< 40 μm) and hard (> 1600 HV) PEO coatings can be achieved by using of high-frequency current.