Answers to the report of Reviewer #2

on the manuscript entitled: **"Characterization of structural, optical, corrosion and mechanical properties of HfO_2 thin films deposited by pulsed DC magnetron sputtering"**
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Authors:

We would like to express our gratitude for your remarks, which let us improve our manuscript. We have taken them into account in the revised version of our paper.
Answering to the Reviewer's remarks, we have introduced some revisions in the manuscript.

Reviewer:

To complete the optical properties characterization add the optical constants of HfO_2 and the wavelength dependent absorption coefficient spectra.

Authors:

Optical constants, such as refractive index and extinction coefficient, as also absorption coefficient spectra were added to the article. Materials and Methods and Results parts were extended with needed comments:

Materials and Methods part:
"The characterization of optical properties was performed by measuring transmittance in the wavelength range of 210 to 1000 nm. A coupled deuterium-halogen lamp was used as a light source, and the characteristics were obtained using an Optics QE65000 spectrophotometer. The analysis allowed to determine the average transmission in the visible wavelength range. Furthermore, the average transmittance at 550 nm was determined using the envelope method with equation 1 [26]:

$$T_{i\,(\lambda=550)} = \frac{2 \cdot T_{\lambda\,max} \cdot T_{\lambda\,min}}{T_{\lambda\,max} + T_{\lambda\,min}} \quad (1)$$

where: $T_{\lambda max}$ is the transmission value of the envelope that passes through the maxima and $T_{\lambda min}$ is the transmission value of the envelope that passes through the minima.
On the basis of the results of transmission measurements, the absorption coefficient spectra were calculated using the following equation 2:

$$a = \frac{1}{t} \cdot \ln(T) \quad (2)$$

where: t is the thickness of the thin film.
Using the reverse engineering method and FilmStar FTG software, the refractive index (n) and the extinction coefficient (k) were also calculated."

Results part:
As shown in Figure 3a, HfO_2 thin films deposited magnetron sputtering were highly transparent in measured region. A sharp decrease in the transmission was observed for wavelengths shorter than 250 nm, showing increased absorption below this wavelength - absorption spectra are shown in Fig. 3b. The average transmittance in the visible range was equal to 89% while the transmission measured using the envelope method for a wavelength equal to 550 nm was equal to 88% for all HfO_2 thin films. Only negligible changes in the refractive index of the deposited hafnia coatings were observed as n at λ=550 nm was in the range of 1.75 to 1.79 (Fig. 3c). In addition, the extinction coefficient of HfO_2 thin films (Fig. 3d) in the visible wavelength range was of the order of 10^{-3}, demonstrating relatively good optical quality and low optical losses of the coatings. The type of generated plasma during magnetron sputtering, as well as the target-

substrate distance, did not influence significantly the optical parameters of the hafnium dioxide thin films.

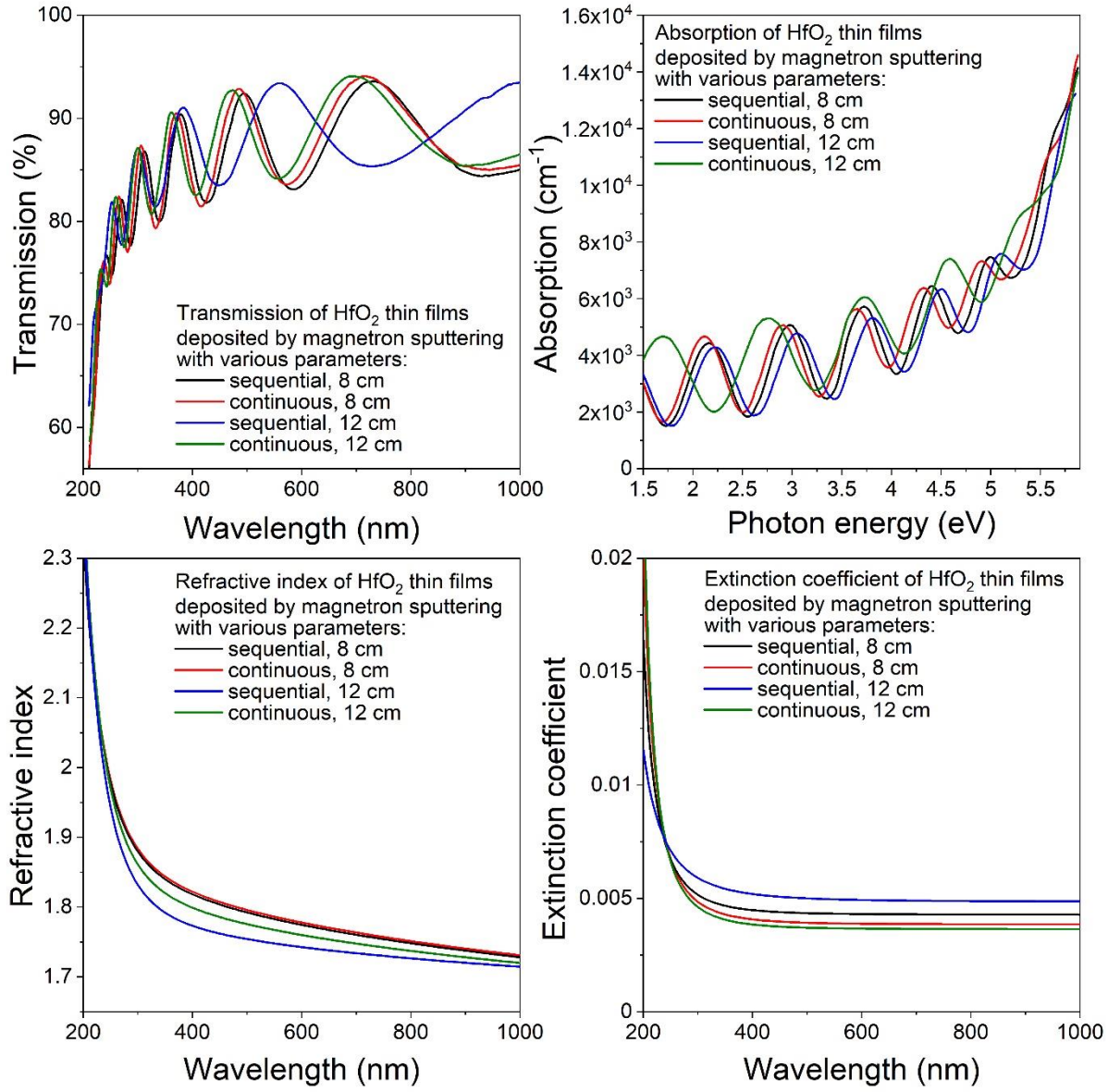

Figure 3. Results of the optical properties investigations of HfO_2 thin films: a) transmission and b) absorption spectra, c) refractive index and d) extinction coefficient.