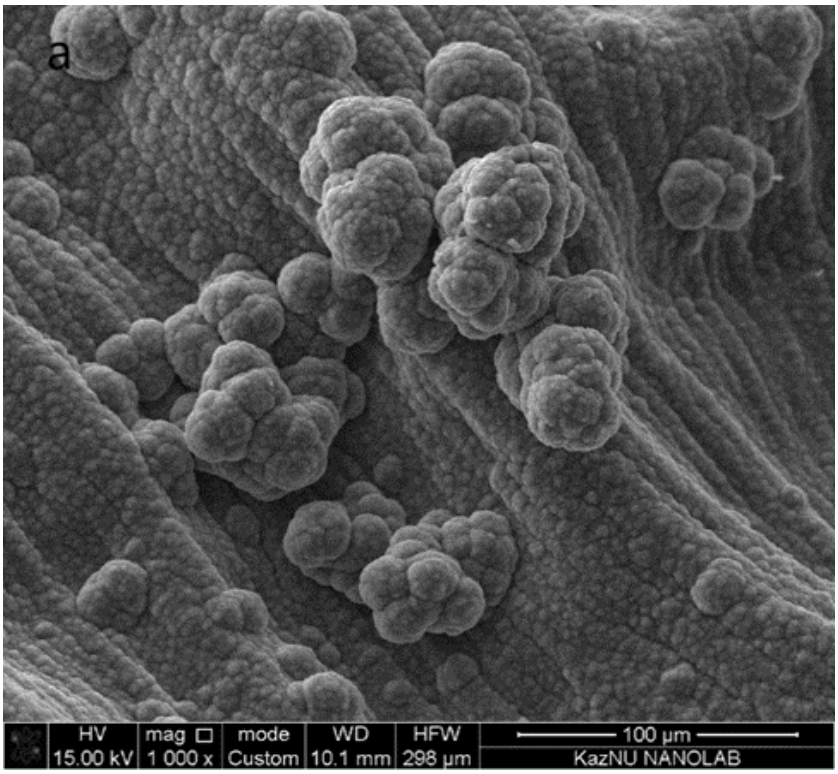
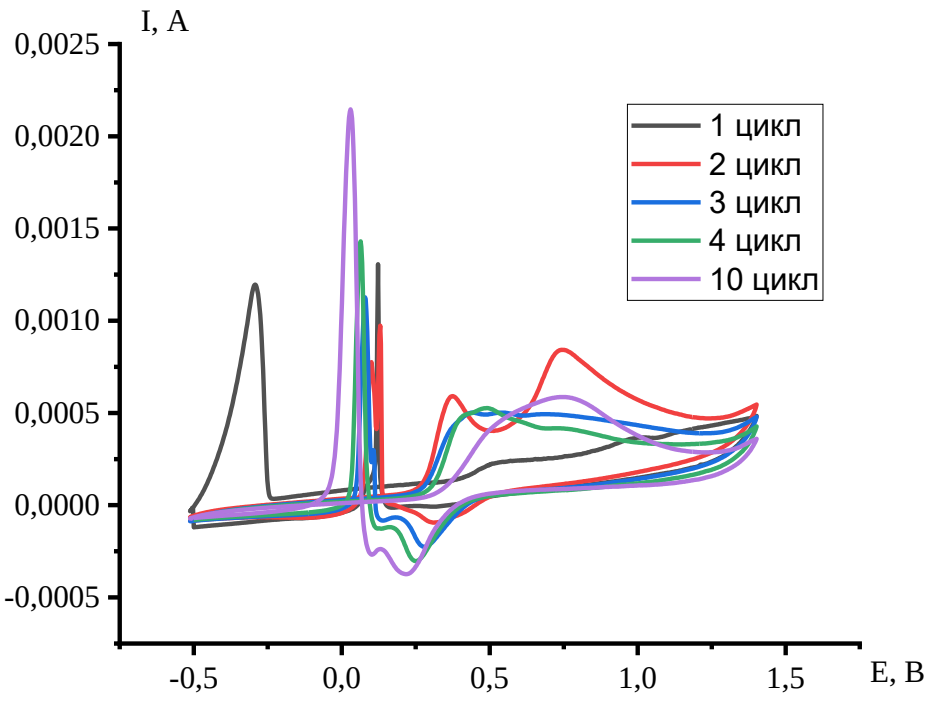
Brief information about the project

Name of the project	AP15473133 «Electrochemical synthesis of polymer nanocomposite coatings on steel with high anticorrosive properties»
Relevance	One of the interesting problems in the metallurgical industry is corrosion protection. To maintain metal structures in a safe condition, it is important to know the mechanism of corrosion, the factors affecting metal corrosion, the interaction of metals with the environment, the content of metals in various environments. Several methods are used to protect metals from corrosion. In recent years, one of the most important branches in electrochemistry is the production of coatings from conductive polymers on the metal surface. The advantage of polymer, copolymer and nanocomposite polymer coatings over paints is that they do not contain toxic substances harmful to the environment. In addition, polymer, copolymer, and nanocomposite polymer coatings act as a physical and electronic barrier on the metal surface. The adsorption of nanocomposite polymer coatings onto the active areas of the metal coating surface slows down the process of metal dissolution and leads to the formation of a homogeneous protective coating. Despite continuous research in this area over the past years, the number of articles describing the mechanism of electropolymerization is very small, and there are not even studies showing the electropolymerization of polyanisidine. Therefore, in this work, in addition to obtaining polymer coatings and studying their anticorrosive properties, the mechanism of the electropolymerization process is considered, the kinetics of adsorption of polymer nanocomposites on a metal surface is studied. In turn, these studies will allow us to obtain fundamental results in the field of corrosion.
Purpose	The aim of the project is electrochemical polymerization of POA/metal oxide polymer nanocomposite coatings, determination of optimal synthesis conditions and study of anticorrosive properties of the obtaining coatings.
Objectives	1. Synthesis of POA, POA/metal oxide coatings by electrochemical method on the surface of mild steel. 2. Investigation of anticorrosive properties of the obtained coatings by linear voltammetry and EIS method. Calculation of corrosion potential (Ecorr, mV), current density (jcorr, A*cm2), protective effect (Z, %), corrosion rate (R, mm/year) at different exposure times.Determination of the electrochemical electrical circuit of the corresponding system. 3. Determination of the mechanism of formation of POA / metal oxide polymer nanocomposite. 4. Investigation of the kinetics of adsorption of polymer nanocomposites of POA / metal oxide on a metal surface.
Expected and achieved results	- The synthesis of POA, POA/metal oxides of nanocomposite polymer coatings by electrochemical method was optimized, the number of cycles and the number of scans were selected. - Coatings of POA, POA/SiO_2, POA/CeO_2, POA/ZrO_2 were synthesized by cyclic voltammetry.

	- To optimize the synthesis process, the scanning speed varied from 5 mV/s, 10 mV/s, 20 mV/s. Based on a visual assessment of the appearance of the obtained films, the optimal scanning speed was selected at 10 mV/S. - To optimize the number of cycles in the process of electrochemical synthesis, synthesis was carried out with a different number of cycles (5, 10, 15) at a speed of 10 mV/s by cyclic voltammetry. Based on a visual assessment of the appearance of the obtained films, the optimal number of cycles was 10. - Synthesized films of POA/SiO_2, POA/CeO_2, POA/ZrO_2 with a scanning speed of 10 mV/s and several cycles of 10. During the synthesis process, it is important to introduce the right amount of nanocomposite into the polymer, so the concentration of fillers varied 0.1%, 0.25% and 0.5%. The obtained films were evaluated by linear voltammetry. The current density of polymer films decreased at a filler concentration of 0.1%, and it was shown that the potential shifted to the right. Therefore, the optimal amount of filler was chosen 0.1%.
Research team members with their identifiers (Scopus Author ID, Researcher ID, ORCID, if available) and links to relevant profiles	Bakhytzhan Yeldana, Researcher, Scopus ID: 57221333561, ORCID: 0000-0002-3217-5927, Researcher ID: AAS-4650-2020 https://www.scopus.com/authid/detail.uri?authorId=57221333561 https://www.webofscience.com/wos/author/record/2409580
List of publications with links to them	No
Patents	No

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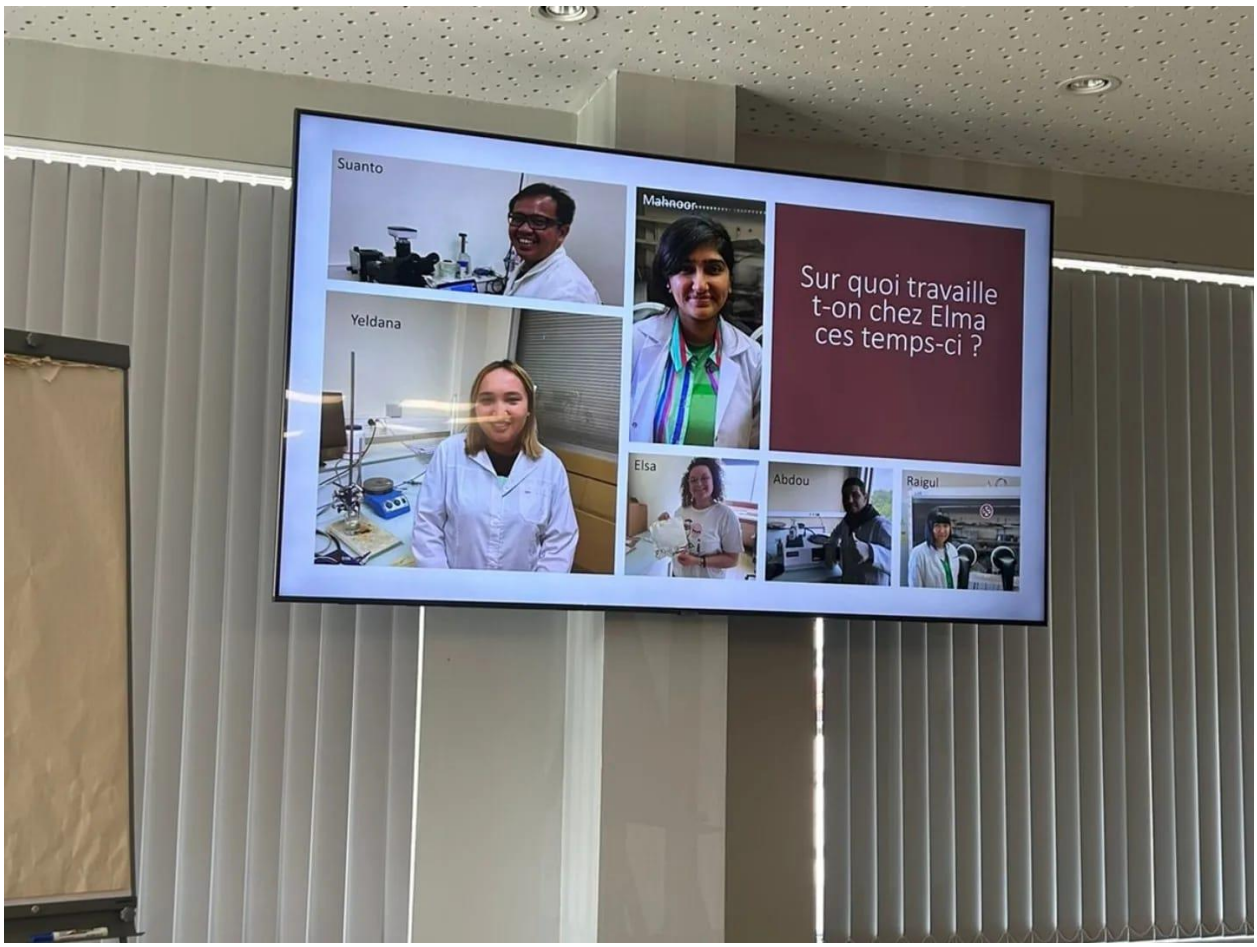
Suanto
Mahnoor
Sur quoi travaille t-on chez Elma ces temps-ci ?
Yeldana
Elsa
Abdou
Raigul