

Physicochemical nanomaterial science

The formation of the mixed layered hydroxides on the steel surface contacting with 3d-metal water salt solutions

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The Fe(II)-Fe(III) layered double hydroxides or *Green Rust* (GR) belong to the primary mineral phases formed on the iron / steel surface in different *open-air systems* [1]. When 3d-metal cations are present in water solutions contacting with the steel surface the mixed layered hydroxides (MLH) appear among other mineral phases such as ferric oxyhydroxides and spinel ferrites.

The purpose of our work is to study the influence of physical-chemical conditions on the formation of the MLH structures on the steel surface. The phase formation process takes place on the surface of the rotating disk electrode made of St3. The NiCl₂, CoSO₄, and CuSO₄ water solutions are used as a dispersion medium. The contact of the steel surface with water solutions lasted 24 h. The main methods of the research are a scanning electron microscopy (SEM), X-ray diffraction (XRD) investigation and thermogravimetry.

Fig. shows the morphology of the MLH structures formed on the steel surface. According to XRD data the anion composition of the solutions determines the type of the MLH structures. Whereas the presence of Cl⁻ and CO₃²⁻ entered from the air leads to the formation of the *fougerite-like* (GRI) structure, the presence of the SO₄²⁻ causes the formation of the GRII structure. At the same time the Fe(II) in the lattice can be partially or completely substituted by 3d-metal cations.

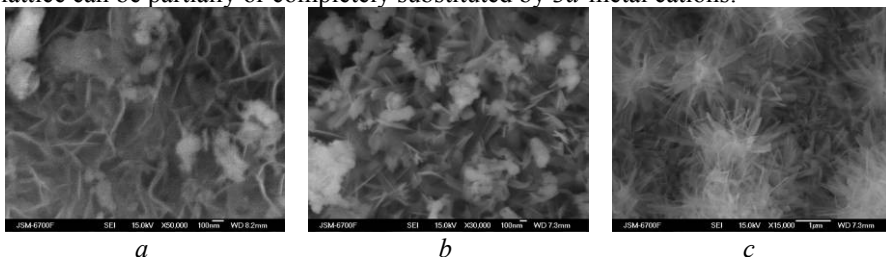


Fig. The mixed LDH structure formed on the steel surface contacting with the following water solutions: a – NiCl₂; 2 – CoSO₄; 3 – CuSO₄.

1. Refait Ph., Memet J.-B., Bon C., Sabot R., Génin J.-M. R. Formation of the Fe(II)-Fe(III) hydrosulphate green rust during marine corrosion of steel //

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