

## STABILITY OF NANOPOROUS SILVER FOAMS IN ELECTROCATALYTIC DEHALOGENATION OF ORGANIC HALIDES

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Nanoporous metal foams (NMFs) are relatively new class of nanoscale materials which consist of metals nanoparticles or filaments interconnected in such way that they form 3D structure. Such materials can be promising for creation of novel supercapacitors, heat sinks, catalysts, electrocatalysts *etc.* It was previously shown by us that Ag NMF fabricated by cathodic electrodeposition of Ag under high current density from acidic aqueous solutions manifested enhanced electrocatalytic activity in reactions of organic halides electroreduction compared to smooth Ag. However, for practical application of Ag NMF, their stability in the course of electrochemical processes should be evaluated.

The aim of this work was to estimate stability of Ag NMF sample in the course of electrochemical reduction of organic halides by the means of cyclic voltammetry (CV) and to compare the stability in the reactions of reduction of different organic halides.

The Ag NMF samples were deposited from  $\text{AgBF}_4 + \text{HBF}_4$  aqueous solution onto glassy carbon disk electrode. The resulted coatings were tested by CV in electrochemical reduction of a set of organic halides, including 1-bromo-4-fluorobenzene (FPhBr),  $\text{CF}_3\text{CHClBr}$  and  $\text{CF}_2\text{Br}_2$  (medium – 0.1  $(\text{C}_4\text{H}_9)_4\text{NBF}_4$  in DMF). The potentials of cathodic peaks which could be attributed to the organic halides reductive dehalogenation were less negative on Ag NMF compared to smooth Ag which could indicate higher electrocatalytic activity of the former that could be explained by existence of active sites on the surface of Ag NMF. Series of consequent CV scans were performed for each halide in two regimes: 1) the scanning was stopped after each scan and the solution was thoroughly stirred; 2) the scanning was performed mostly without interruption and was stopped and the solution was stirred only before selected scans. CVs of consequent scans of all studied halides were highly reproducible within regime 1 which could indicate their stability in such regime. The scanning in regime 2 led to reversible (recovered after stirring) current decay of FPhBr (Fig.) and  $\text{CF}_2\text{Br}_2$  reduction peaks (which could be explained by exhausting of the halides within the NMF pores) and to irreversible cathodic shift (Fig.) in the case of  $\text{CF}_3\text{CHClBr}$ . Such irreversibility could be explained by the NMF active sites degradation due to formation of soluble Ag  $\pi$ -complexes with  $\text{CF}_2=\text{CHCl}$  ( $\text{CF}_3\text{CHClBr}$  reduction product).

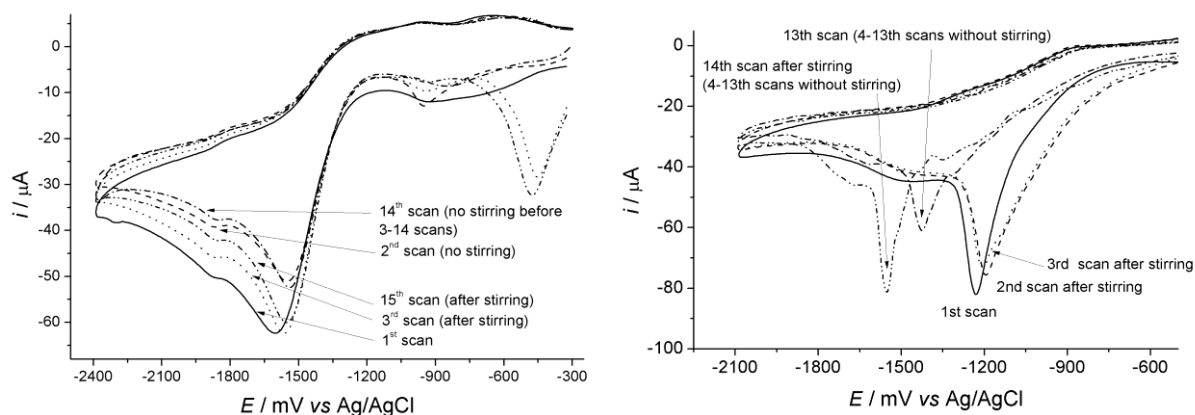


Fig. CVs of FPhBr (5.3 mM, left) and  $\text{CF}_3\text{CHClBr}$  (5.5 mM, right) on Ag NMF