

**SOL GEL PREPARATION OF TiO₂/ZrO₂
FILMS AND PHOTOCATALYTIC
REDUCTION OF Cr(VI) IN AQUEOUS
ACID MEDIA**

Anna Eremenko,¹ Natalie Smirnova,²
Yaroslav Divinsky³ and Nadiya Vityuk⁴

¹Institute of Surface Chemistry Kiev, Ukraine
17 Gen. Naumov str.

—
Kiev 03164
Ukraine

²as1
as1

—
as1 as1
as1

³as1
as1

—
as1 as1
as1

⁴as1
as1

—
as1 as1
as1

**SOL GEL PREPARATION OF TiO₂/ZrO₂ FILMS
AND PHOTOCATALYTIC REDUCTION OF Cr
(VI) IN AQUEOUS ACID MEDIA**

Anna Eremenko*, Natalie Smirnova, Yaroslav Divinsky, Nadiya Vityuk Institute of Surface Chemistry of National Ukrainian Academy of Sciences, 03164 Kiev, Ukraine, *annerem@mail.kar.net

In the past years problems related to the elimination of toxic and hazardous chemical substances such as heavy-metal and radioactive ions from waste effluents and previously contaminated sites have emerged as a high international priority. Chromium (VI) is a very toxic pollutant, which is present in a great variety of industrial wastes. TiO₂ is an effective semiconductor which is often used for the photocatalytic decontamination of toxic heavy metal ions (Hoffmann et al. Chem. Rev 1995). One of the promising routes for the preparation of dense nanometer coatings is via sol-gel synthesis. In order to obtain composite oxide films with corrosion resistances against concentrated acid and basic solutions, in this work ZrO₂/TiO₂ films with 5–30 glass substrates by the sol-gel process using the dip-coating technique and compared with that of TiO₂ (P-25). The precursors of the binaries were composed of two tetraalkoxides (a zirconium and a titanium tetraalkoxide) in presence of chelating agent acetylacetone and CTAB. Stable transparent porous Ti/Zr films demonstrate a photocatalytic activity in the process of Cr(VI) reduction to Cr(III) in the acid water solutions in presence of environmentally important substrate EDTA. All samples were active; although the efficiency was lower that of TiO₂. At 5–25 efficiency increased and remains constant when 30–100 efficiency of Cr(VI) reduction in the presence of EDTA was strongly increased. Films are active in the process of Cr(VI) photoreduction after 5 cycles of irra-

diation. Obtained ZrO₂/TiO₂ films are stable in the 4N NaOH solution during several hours. The results of this work are important for future investigations on the improvement of the TiO₂ photocatalytic efficiency.