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Photocatalytic Activity of Solid-State Synthesized Associate Nanocrystalline AgCl@Ag

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Associate nanocrystalline AgCl@Ag powders were prepared via mechanochemical synthesis by using a diluent and a reducing agent in milling system. The X-ray powder diffraction analysis and transmission electron microscopy demonstrated that silver nanoparticles were introduced on the surface of the silver chloride nanoparticles and the nanostructured AgCl@Ag photocatalytic composite were successfully synthesized (Figure-1). To determine the photooxidation capability of AgCl@Ag, was tested the decomposition of methylene blue dye in solution over the AgCl@Ag photocatalysts under sunlight irradiation. The synthesized photocatalyst exhibited the increased photocatalytic performance over titanium oxide nanomaterials.

Due to a point ionic defects and electron traps, AgCl nanoparticles have high photosensitivity[1], despite the fact that direct band gap of AgCl is 5.6 eV and indirect band gap is 3.25 eV[2]. Silver nanoparticle's surface plasmon state leas in the visible region, consequently absorption of visible light by AgCl@Ag nanocomposite takes place at the silver nanoparticles.

The mechanochemical method to AgCl@Ag synthesis offers several advantages compared to traditional methods, including low temperature fast solid-state ion exchange reaction and preferable low expenses.

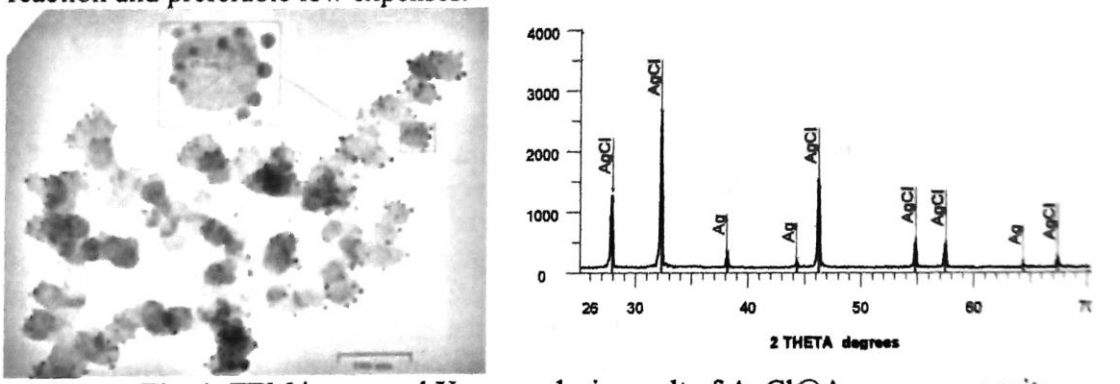

Fig. 1. TEM image and X-ray analysis result of AgCl@Ag nanocomposite.

Acknowledgements

The work is supported by the funding program 0130/PTsF-14 of the RK.

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