

High aluminum zeolite coatings on corrodible metal surfaces

Tech ID: 29591 / UC Case 2004-165-0

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	7,179,547	02/20/2007	2004-165

FULL DESCRIPTION

Background

As coatings on porous substrates, low-silica-zeolites (LSZ), form membranes capable of separating mixtures at the molecular level. Their use as coatings on non-porous substrates can extend and improve adsorption applications over powder-based adsorbents. By combining the low weight and high thermal conductivity of aluminum with the ability of LSZ to remove contaminants and produce oxygen enriched air, desirable alternatives are offered for weight and size conscious applications. The high pH inherent in LSZ synthesis solutions is very corrosive and dissolves the aluminum substrate during synthesis.

Current Invention

Prof. Yushan Yan and his team at UCR have developed a novel, patented composite coating through a three step synthesis method that for the first time allows for the union of LSZ coating with aluminum substrate. In the first, the bottom layer is formed by synthesizing a high silica zeolite (HSZ) Zeolite Socony Mobil-5 (ZSM-5) film on the aluminum alloy 2024-T3 (Al 2024-T3) substrate. In the second step, the ZSM-5 film is seeded with zeolite Y followed by a short ZSM-5 synthesis to form the bridging layer. Finally, the LSZ Y film is synthesized on the bridging layer by seeded growth to form the top layer.

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OTHER INFORMATION

KEYWORDS

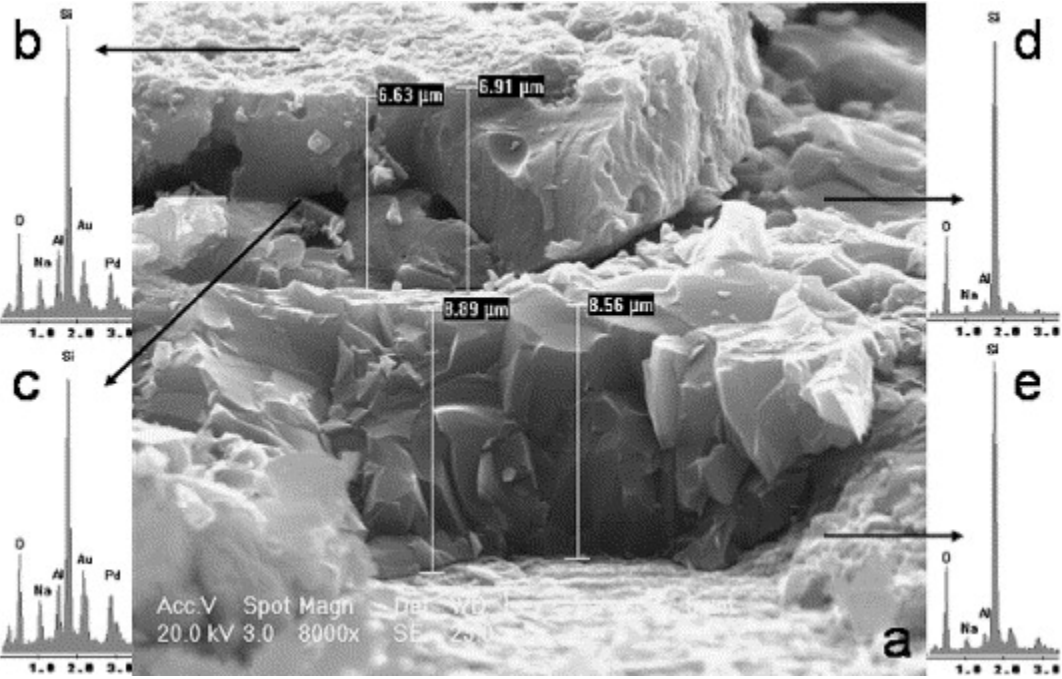
Air conditioning systems, Air separation systems, Oxygen enriched air, Adsorbent, Aluminum coating, Corrosion resistance

CATEGORIZED AS

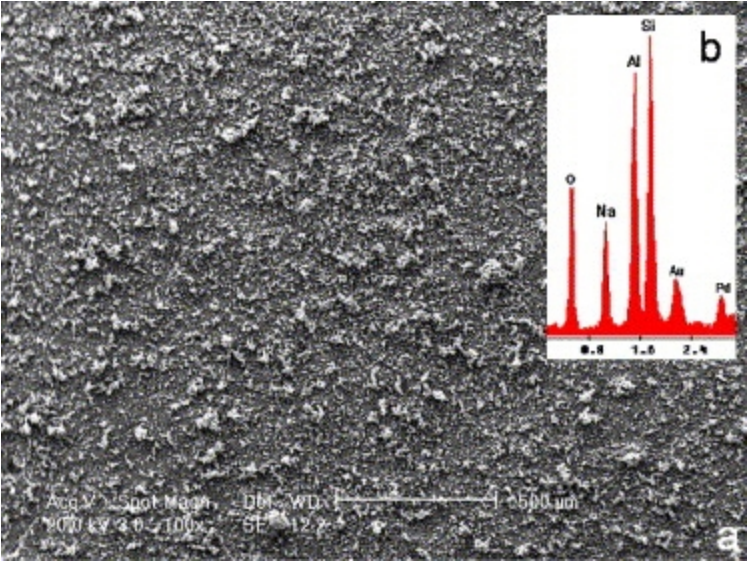
- [Environment](#)
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RELATED CASES

2004-165-0



(a) Scanning Electron Microscopic (SEM) image of bridging layer and bottom layer on Al 2024-T3; Energy Dispersive X-ray Spectroscopy (EDAX) spectra of the (b) top and (c) side of the bridging layer. EDAX spectra of the (d) top and (e) side of the bottom layer.



(a) SEM image at low magnification and (b) EDAX spectrum of the top layer surface.

ADVANTAGES

The significant aspects of their invention are:

- ▶ The synthesis of the bridging layer allows for the adhesion of the LSZ coating to the substrate.
- ▶ The synthesis method produces a top layer that is continuous and evenly inter-grown.
- ▶ The composite coating has the corrosion resistance from the bottom layer and hydrophilicity and anti-microbial capability from the top zeolite layer.
- ▶ The composite has high surface roughness which is beneficial for adsorption applications.

SUGGESTED USES

A wide variety of applications could benefit from this invention, including:

- ▶ Air conditioning and air separation systems where the coating increases the heat transfer efficiency and selectively adsorbs moisture.
- ▶ Hydrophilic and anti-microbial coatings on heat exchangers for water separation in space.
- ▶ Applications requiring removal of contamination and producing oxygen enriched air where size and weight conscious applications.

RELATED MATERIALS

- ▶ [Zeolite Y coatings on Al-2024-T3 substrate by a three-step synthesis method](#)

INVENTIONS BY PROF. YUSHAN YAN AT UC

Please see all [invention by Prof. Yushan Yan and his team at UC](#)