

塗膜の雨筋汚染性と雨滴挙動に関する研究

Study on the Relationship between Raindrop Stain and Behavior of Running Water Droplets on Coatings

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要 旨

我々は、非シリケート型防汚成分を用いることで1液での塗料安定性を確保し、耐雨筋汚染性に優れたプレコート鋼板用の新規塗料を開発している。開発塗膜の水の静的接触角は、良好な耐汚染性を示すと報告されている値と比較してやや高く、従来知見に当てはまらなかった。そこで、耐汚染機構に関する新たな知見を得るために、高速度カメラを用いて各塗膜上の水滴流下挙動を解析した。耐汚染性が良好な塗膜表面はいずれも動的な収縮接触角が低く、水滴の連続流下においては塗膜上の残滴との合一時に大きく形状が乱れ、筋状の濡れ跡を残しながら流下していた。その水滴の内部流動を蛍光粒子の添加により可視化したところ、粒子が塗膜と水滴の界面付近を垂直に流動している様子を確認できた。このことから、屋外においても雨滴中の微小な汚染物質が同様に流動しやすく、その流動が塗膜への付着を阻害していると示唆された。

Abstract

We newly developed raindrop stain resistance coatings with good stability as one-component systems for pre-coated steel sheet, which contain anti-stain agents, but including no silicate compounds. Static contact angles of water on these coatings were a little larger than those of the reported coatings that good stain resistance were performed. These results were different from existing knowledge. So, in order to obtain novel knowledge of anti-raindrop-stain mechanism, we analyzed running behavior of water droplets on several kinds of coatings using high-speed camera. Dynamic contracting contact angles of the droplets on the stain resistance coatings were smaller than on conventional ones. When the next droplet united to residual droplets on the coatings the droplets were deformed, and then flew down leaving linear water trail. In order to visualize internal flowing behavior of running droplets, fluorescent particles were added in water as tracer. It was recognized that the particles in water droplets were flowing parallel near the surface of the coatings. This suggested that microscopic pollution particles in raindrops also flow at exterior walls and are prevented from sticking on the surface of coatings by the internal flowing behavior.