Seed Encrusting

kuraray

Kuraray Poval™

KURARAY POVAL™

Seed Encrusting

Encrusting of seeds is a technology used to improve the efficiency and success of planting, by providing the following benefits:

- **Improved size, shape, and weight:** Seed encrusting increases the size and weight of the seeds, making them easier to handle in mechanical planting equipment. Additionally, encrusting provides more uniform seeds, enhancing the efficiency and precision of the sowing process.
- **Seed protection:** Encrusting of seeds enables the incorporation of active ingredients to protect the seed against pathogens and improve plant development and growth.
- **Better visibility:** Adding color to encrusted seeds help distinguish them from the soil.

Encrusting includes two key components:

- **Filler material,** such as lime or other minerals, which adds bulk and weight.
- **Binder,** to ensure proper adhesion of the powder to the seed.

KURARAY POVAL™ (PVOH) is used as a binder in the encrusting process.

KURARAY POVAL™ is the brand name of Kuraray's globally produced polyvinyl alcohol (PVOH). It contains the following properties:

- ✓ Water soluble
- ✓ Inherently biodegradable
- ✓ Inert

To facilitate the selection of appropriate KURARAY POVAL™ grades for encrusting, we offer a comprehensive guideline that helps users evaluate key attributes, molecular weight, viscosity and the degree of hydrolysis (DH).

Influence of molecular weight

The viscosity of PVOH is typically determined in a 4 wt.% aqueous solution at room temperature in mPa·s. It is a measure of the molecular weight of the PVOH polymer chains. Higher molecular weight leads to higher solution viscosity, mechanical strength, and binding power. Various types of KURARAY POVAL™ are used for seed encrusting. A good balance between polymer molecular weight as well as viscosity and concentration of the binder solution is very important.

The data in **Figure 1** shows that higher molecular weight KURARAY POVAL™ grades (13-88 and 22-88) demonstrate lower dust-off compared to lower molecular weight grades (6-88) at the same concentration. This is linked to higher mechanical strength and binding power of the high molecular weight grades.

INFLUENCE OF POLYMER MOLECULAR WEIGHT ON DUST-OFF

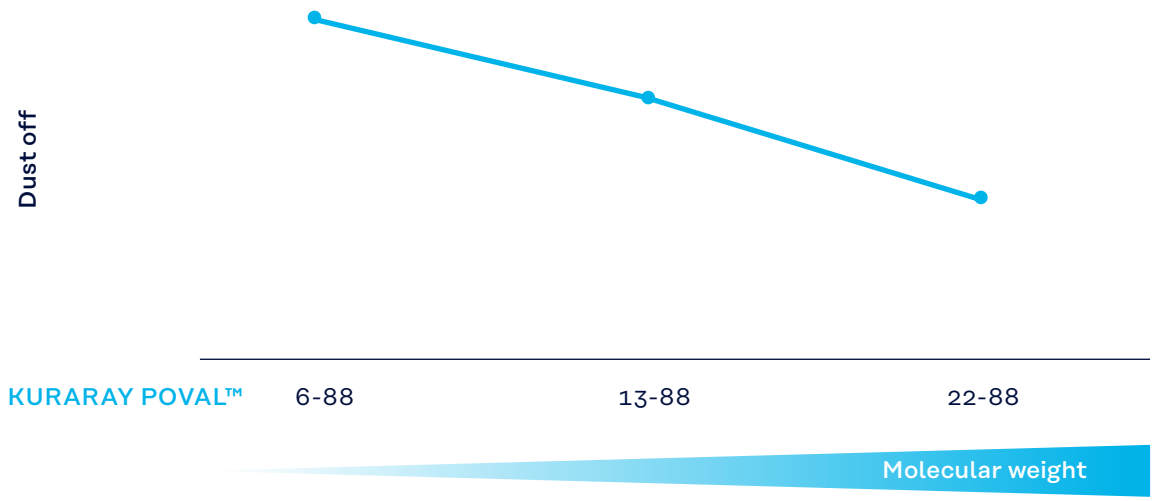

Figure 1. This graph illustrates the effect of polymer molecular weight on the dusting properties of coated seeds. A total of 100 g of grass seed (Festuca rubra) was encrusted with 100 g of pure $CaCO_3$ using 34 mL of a 7% solution of KURARAY POVAL™. The coating process was carried out in a Hoopman HR 160 laboratory rotary coater (ø16 cm).

The coating liquid must maintain a certain flow behavior to ensure good coating quality and even dispersion of the binder on the seeds. With higher molecular weight polymers this can be sometimes challenging, as their solution viscosity increases significantly at higher concentrations. Therefore, selecting the appropriate concentration for a specific grade is very important. In the Table 1, we introduced a concentration recommendation for a specific grade, based on our internal evaluation.

Influence of degree of hydrolysis

The degree of hydrolysis (DH) is the second key parameter that largely influences the properties of PVOH. PVOH is produced by hydrolysis of polyvinyl acetate and DH expresses to which extend this reaction took place. A low DH means that there are still numerous acetate groups remaining, which leads to higher surface activity, better water solubility and lower crystallinity.

Based on the data obtained from the laboratory screening, the lower DH grades KURARAY POVAL™ 5-74 and 5-82 seem to perform better than KURARAY POVAL™ 6-88 at the same concentration, demonstrating reduced dusting and agglomeration (**Figure 2**). This effect may be attributed to lower surface tension resulting from a reduced degree of hydrolysis.

INFLUENCE OF DEGREE OF HYDROLYSIS ON DUST-OFF

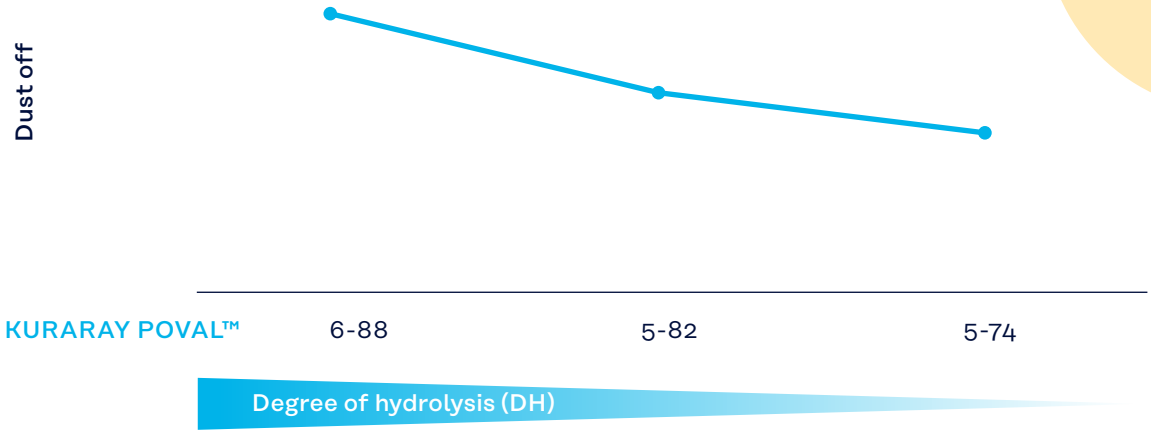

Figure 2. This graph illustrates the effect of degree of hydrolysis (DH) on the dusting properties of coated seeds. All tested grades had comparable molecular weight while having variations in the degree of hydrolysis from 74-88%. A total of 100 g of grass seed (Festuca rubra) was encrusted with 100 g of pure $CaCO_3$ using 34 mL of a 7% solution of KURARAY POVAL™. The coating process was carried out in a Hoopman HR 160 laboratory rotary coater (ø16 cm).

Key takeaways

- Dust off declines with higher molecular weight
- Low molecular weight grades enable higher polymer concentrations
- Dust off and agglomeration are lower with lower DH grades

How to use KURARAY POVAL™ for encrusting

SOLUTION PREPARATION, GENERAL GUIDELINE

- Disperse KURARAY POVAL™ resin into agitated cold water (20-25°C). The dissolving process should take place in corrosion resistant vessels.
- Heat the suspension to 90-95 °C in a water bath or using live steam. Partially hydrolyzed grades can be dissolved at lower temperatures.
- Hold for 60 minutes.
- The solution should be stirred during cooling in order to prevent skin formation.

A properly prepared solution should be fully transparent and without undissolved particles. The speed of dissolution increases with increasing temperature. The speed of dissolution decreases with increased molecular weight (increased viscosity of the aqueous solution). The dissolving process is also made more difficult when there is a transition to higher concentrations.

Table 1: General recommendation of grades, concentration, and dosage of KURARAY POVAL™ for the encrusting process.

Grade Name KURARAY POVAL™	Solution concentration	Polymer ration on powder (filler)
5-74	7-10 %	2-4 %
5-82	7-10 %	2-4 %
3-83	7-10 %	2-4 %
13-88	5-7 %	2-4 %
18-88	5-7 %	2-4 %
22-88	5-7 %	2-4 %

REGULATORY COMPLIANCE AND CERTIFICATIONS

- **Synthetic Polymer Microparticle Definition**
  In line with Regulation (EU) No. 2023/2055, which sets definitions and defines testing methods for synthetic polymer microparticles, we have tested our products. Grades of KURARAY POVAL™ listed in **Table 1** are excluded from the synthetic polymer microparticle definition.

- **BPI certification**
  Grades of KURARAY POVAL™ listed in **Table 1** are certified in accordance with the terms and conditions of the "International Biodegradable Products Institute (BPI), Inc. Licensing & Certification Program for Compostable Products".

- **OMRI – Organic Material Review Institute**
  KURARAY POVAL™ 22-88 and 3-83 are OMRI Listed®. It may be used in certified organic production or food processing and handling according to the USDA National Organic Program regulations.

RESTRICTIONS
For use as an inert ingredient in combination with permitted active pesticidal ingredients. May only be used if the requirements of 205.206(e) are met, which require the use of preventive, mechanical, physical, and other pest, weed and disease management practices.

Adding value to your products – worldwide

KURARAY POVAL™, EXCEVAL™, ELVANOL™, and MOWIFLEX™ are the trademarks for polyvinyl alcohols (PVOH) resins made by Kuraray. Their key characteristics — outstanding film-forming properties and high binding strength — add real value to your products. Our polymers are water-soluble, highly reactive, crosslinkable and foamable. They have high pigment binding capacity, protective colloid characteristics and thickening effects. The physical and chemical properties of KURARAY POVAL™ make it ideal for a wide variety of applications, ranging from adhesives through paper and ceramics to packaging films. Many of our polymers are food contact-approved and thus suitable for food applications.

Kuraray produces its wide range of KURARAY POVAL™ grades in Japan, Singapore, Germany and the United Staes. Kuraray's global production and service network make us your partner of choice for innovative high-quality PVOH resins.

Kuraray Poval™

PLEASE CONTACT US

kuraray-poval.com

kuraray

HEADQUARTERS

Kuraray Co., Ltd.
Tokiwabashi Tower
2-6-4, Otemachi
Chiyoda-ku
Tokyo, Japan 100-0004

Kuraray America, Inc.
3700 Bay Area Blvd.,
Suite 680 Houston, TX77058
United States of America

Kuraray Asia Pacific Pte., Ltd.
1 North Buona Vista Link
#12-10/11, Elementum
Singapore 139691

Kuraray Europe GmbH
Philipp-Reis-Str. 4
65795 Hattersheim am Main,
Germany

Kuraray Shanghai Co., Ltd.
Unit 2207, 2 Grand Gateway
3 Hongqiao Road, Xuhui District, Shanghai
200030, China

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