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A METHOD FOR EVALUATING THE CORROSION POTENTIAL OF A TABLET PRESS TURRET BY DRUG SUBSTANCES, GRANULATIONS OR POWDER BLENDS.

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ABSTRACT

A preformulation test was developed in which the corrosion potential of drug substances, granulations or powder blends could be evaluated. Abrasion by the powder on a metal plate simulating the abrasion occurring during the rotation of a rotary tablet press turret was found to be critical. The method demonstrated the influence of high and moderate relative humidities upon a particular granulation which was known to corrode a turret during tablet manufacture.

INTRODUCTION

Recently Narukar, et al. (1) described the effects of humidity, temperature, contact time and tooling composition on the corrosion of steel tooling by a hydrochloride salt, REV 6000-A(SS).

We wish to report a similar experience involving the corrosion of a tablet press turret by a granulation, and the development of a preformulation test to discern the potential for such a problem.

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MATERIALS AND METHODS

Materials

Two proprietary drug substances, McN-4097-12-98 (a sulfate hydrate) and McN-R-1832-11-98 (a hydrochloride hydrate), and a granulation of McN-R-1832-11-98 were used. Five pieces of lightly polished type GA 50, meehanite metal bars[1] (ca. 1½" x 3" x ⅛") obtained from a used rotary tablet press turret were used as test plates.

Saturated solutions of calcium chloride, sodium bromide, sodium nitrite and ammonium chloride (2) were placed into 20 gallon rectangular tanks with plexiglas lids to provide the relative humidities (RH). A relative humidity and temperature sensor was mounted and sealed into the plexiglas tank lids. The sensors were connected to an electric hygrometer/thermometer[2], which allowed constant monitoring of the temperatures and humidities within the chambers. All experiments were conducted at 25°.

Method

For each humidity test condition, a meehanite bar was placed onto a 300-1000 mg bed of test material (drug substance or granulation) in a petri dish. The covered petri dish was agitated for 15 minutes on a mechanical sieve shaker[3] set at 50%. The bar was brushed clean, using a camel hair brush, and placed into the humidity chamber with the contact side facing up. The bars were inspected and photographed after overnight incubation (ca. 16 h) in the chambers.

TABLE 1
Condition of the Meehanite Test Plate Abraded With McN-R-1832-11 Granulation After 16 Hours.

RH, %	Appearance
84	Rust-Red Discoloration
75	Brown-Black Discoloration
51	Very Slight Discoloration
33	No Discoloration

RESULTS AND DISCUSSION

Since several pilot granulations of McN-4097-12-98 and McN-R-1832-11-98 discolored tablet press turrets during tablet manufacture, the initial experiments were designed to evaluate the corrosiveness of those drug substances. The result from experiments at 83% RH substantiated the pilot granulation experiences as both drug substances caused severe rusting-red discoloration after 16 hours with McN-4097-12-98 being more corrosive than McN-R-1832-11-98.

The method also demonstrated the relationship of relative humidity to the drug substance-metal interaction using a granulation of McN-R-1832-11-98 which discolored a tablet press turret during tablet manufacture (Table 1 and Figure 1). There was no rusting at very low humidity, 33% RH, after an overnight incubation. Slight discoloration occurred at moderate humidity, 51% RH. Severe corrosion occurred at 75 and 84% RH. The results correlated with experience.

The agitation step was included to simulate the abrasion of the meehanite turret by the granulation during turret rotation. When the abrasion step was omitted, and the granulation was manually

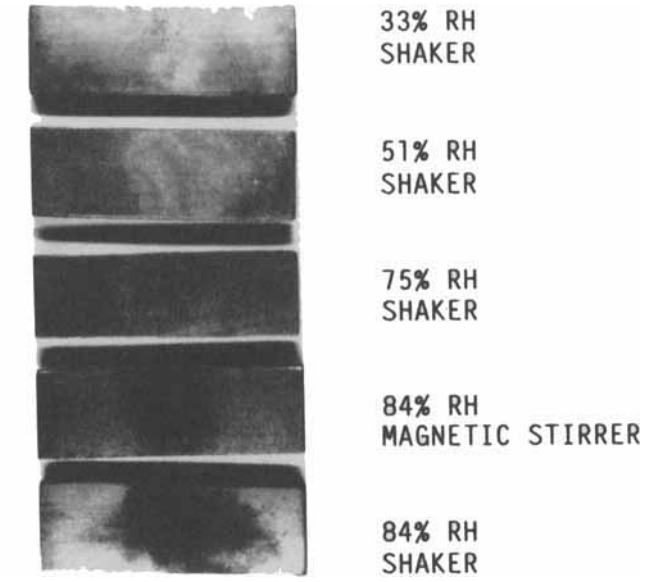

FIGURE 1

Photograph of Meehanite Test Plates Abraded With a McN-R-1832-11-98 Granulation After 16 Hours Incubation

compressed onto the test bar, no corrosion was observed at ~83% RH. Extending the incubation period to six days did not change the outcome of the test.

The method also allows for variations in humidity and exposure time. An overnight (ca. 16-hour) incubation is of benefit for longer compression runs (i.e., batches requiring more than a single shift for compression).

A predictive advantage of the test may also be utilized by abrading the test strip with the granulation and exposing it to the ambient conditions of the room where the tablet press is used, either on the day of manufacture or preceding it. Periodic observation of the test plate exposed in the room would indicate the

likelihood of an interaction. This would be of particular value in situations where the relative humidity of a compression area is controllable and measurable, but comparable humidity chambers are not available.

A magnetic stirrer could also be used to provide agitation of the test bar. Comparable rusting and discoloration were observed when test bars were agitated with a magnetic stirrer and the mechanical shaker (Figure 1). The advantage of the mechanical shaker is that a number of test bars may be agitated simultaneously under identical conditions, allowing the testing of different granulations, excipients and humidity conditions simultaneously.

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FOOTNOTES

1 Scheu and Kniss, Inc, Louisville, KY.

2 Hygro-Therm. Model HT-1, Jersey Technical Electronics Inc, Middlesex, NJ.

3 Thomas Sieve Shaker, Arthur H. Thomas, Philadelphia, PA.

REFERENCES

1. A. N. Narukar, A. R. Purkaystha and P. Sheen, Drug Dev. and Ind. Pharm., 11, 1487, 1985.

2. P. W. Winston and D. H. Bates, Ecology, 41, 232, 1960.