

1
00:00:02,680 --> 00:00:12,238
[Music]

2
00:00:13,119 --> 00:00:17,839
mirrors on a telescope are often coated

3
00:00:15,650 --> 00:00:20,390
with some kind of metal in order to

4
00:00:17,839 --> 00:00:22,490
reflect as much light as possible now

5
00:00:20,390 --> 00:00:25,039
the type of metal depends upon the kind

6
00:00:22,489 --> 00:00:27,079
of light the telescope is looking at the

7
00:00:25,039 --> 00:00:30,320
James Webb Space Telescope is looking at

8
00:00:27,079 --> 00:00:32,989
infrared light and for that gold is the

9
00:00:30,320 --> 00:00:34,579
ideal choice to find out how the gold is

10
00:00:32,990 --> 00:00:35,690
put on to the mirrors of the James Webb

11
00:00:34,579 --> 00:00:37,339
Space Telescope

12
00:00:35,689 --> 00:00:40,339
we're here at quantum coating in

13
00:00:37,340 --> 00:00:42,500
Moorestown New Jersey so Ian how much

14
00:00:40,340 --> 00:00:44,810
gold are we talking about enough for a

15
00:00:42,500 --> 00:00:47,269
ring not even that well it depends on

16
00:00:44,810 --> 00:00:48,770
how big your ring is of course but the

17
00:00:47,270 --> 00:00:51,530
thickness of the coating is almost

18
00:00:48,770 --> 00:00:54,050
unimaginably small to give an example

19
00:00:51,530 --> 00:00:58,160
this piece of paper is about one

20
00:00:54,049 --> 00:01:00,739
thousandth of an inch we could take 1000

21
00:00:58,159 --> 00:01:02,689
gold coatings stack them all side by

22
00:01:00,740 --> 00:01:04,308
side and they would be the thickness of

23
00:01:02,689 --> 00:01:06,769
this piece of paper in terms of the

24
00:01:04,308 --> 00:01:09,829
amount of gold that we need it comes to

25
00:01:06,769 --> 00:01:13,728
three grams of material and three grams

26
00:01:09,829 --> 00:01:16,280
looks like this wow that's amazing

27
00:01:13,728 --> 00:01:18,799
considering how big the mirrors that

28
00:01:16,280 --> 00:01:20,748
amount when it's spread out thin enough

29

00:01:18,799 --> 00:01:22,399
covers the whole surface of the hexagon

30
00:01:20,748 --> 00:01:24,920
when you apply the coating are we

31
00:01:22,399 --> 00:01:27,590
talking about the paint job no this is

32
00:01:24,920 --> 00:01:28,789
called vacuum deposition it happens in a

33
00:01:27,590 --> 00:01:31,219
chamber where all of the airs

34
00:01:28,789 --> 00:01:34,099
constructor to create a vacuum then we

35
00:01:31,218 --> 00:01:36,678
vaporize the gold we create a cloud of

36
00:01:34,099 --> 00:01:39,259
vapor and that vapor condenses on the

37
00:01:36,679 --> 00:01:42,259
surface to form the film and why do you

38
00:01:39,259 --> 00:01:44,349
choose to apply the gold that way that's

39
00:01:42,259 --> 00:01:46,429
the way to get the maximum reflection

40
00:01:44,349 --> 00:01:48,858
spray painting or other techniques

41
00:01:46,429 --> 00:01:50,600
wouldn't give us enough reflection can

42
00:01:48,858 --> 00:01:51,949
we actually see the gold being applied

43
00:01:50,599 --> 00:01:54,530

to a mirror

44

00:01:51,950 --> 00:01:56,149
sure Tai's the guy who operates the

45

00:01:54,530 --> 00:01:56,840
coating machine he'd be happy to show

46

00:01:56,149 --> 00:01:59,929
you how that works

47

00:01:56,840 --> 00:02:02,060
hey ty hey how you doing here I was told

48

00:01:59,929 --> 00:02:03,829
that a coating process is about to start

49

00:02:02,060 --> 00:02:05,929
sure we're about to start the curtain

50

00:02:03,828 --> 00:02:08,288
shirt soon can we tag along

51

00:02:05,929 --> 00:02:08,289
sure

52

00:02:09,099 --> 00:02:14,180
okay see what we're doing here now we're

53

00:02:12,080 --> 00:02:16,310
preparing the beer for coating in the

54

00:02:14,180 --> 00:02:18,469
mirror of any contaminants or any

55

00:02:16,310 --> 00:02:22,280
particles and that could be on the

56

00:02:18,469 --> 00:02:23,960
mirror so ty what's going on here now

57

00:02:22,280 --> 00:02:25,509
okay right now we're putting on the

58
00:02:23,960 --> 00:02:28,640
shield in the past for the mirror

59
00:02:25,509 --> 00:02:30,530
coating cannot be beyond a certain area

60
00:02:28,639 --> 00:02:32,059
on the mirror so you want the gold to

61
00:02:30,530 --> 00:02:33,590
just be on the surface nothing on the

62
00:02:32,060 --> 00:02:35,300
sides or anything right there's a bevel

63
00:02:33,590 --> 00:02:39,200
also on the edge of the mirror we don't

64
00:02:35,300 --> 00:02:41,630
want any coating on the bevel either how

65
00:02:39,199 --> 00:02:46,488
long as it's gonna take oh maybe an hour

66
00:02:41,629 --> 00:02:49,459
in total I understand there are no

67
00:02:46,489 --> 00:02:51,200
cameras in the chamber can we see what's

68
00:02:49,459 --> 00:02:54,379
going on we take a look inside our

69
00:02:51,199 --> 00:02:58,089
viewport you see the part rotating and

70
00:02:54,379 --> 00:02:58,090
we can see the glow dispersed right now

71
00:02:59,189 --> 00:03:04,479
so time we couldn't show the actual

72
00:03:01,419 --> 00:03:06,699
company specific equipment that was used

73
00:03:04,479 --> 00:03:08,530
to apply the coding but we get to see

74
00:03:06,699 --> 00:03:10,449
the gold-coated mirror fresh out of the

75
00:03:08,530 --> 00:03:13,360
chamber yeah that's neat look at it out

76
00:03:10,449 --> 00:03:14,949
the mirror is coated now we're all

77
00:03:13,360 --> 00:03:16,810
complete and we're ready to ship it off

78
00:03:14,949 --> 00:03:19,599
to the customer and you can begin their

79
00:03:16,810 --> 00:03:21,340
testing well thanks so much for guiding

80
00:03:19,599 --> 00:03:24,039
us through your coding process was

81
00:03:21,340 --> 00:03:26,590
fascinating well not a problem at all as

82
00:03:24,039 --> 00:03:27,969
you can see gold isn't just a fashion

83
00:03:26,590 --> 00:03:30,909
accessory for the James Webb Space

84
00:03:27,969 --> 00:03:33,419
Telescope but a critical addition to

85
00:03:30,909 --> 00:03:35,319
making the telescope work its very best

86

00:03:33,419 --> 00:03:38,219
thanks for joining us for another

87
00:03:35,319 --> 00:03:44,099
edition of behind the Webb

88
00:03:38,219 --> 00:03:44,099
[Music]

89
00:03:46,240 --> 00:03:50,419
[Music]