Low Loss Splicing Method
to Join Silica and Fluoride Fibers

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ABSTRACT

By decreasing the arc power and choosing the optimal arc time, we use the FSM-20PM ARC Fusion Splicer for joining fluoride(ZBLAN) and silica fibers. The best results of the splice loss is 1.58dB, and the results can be improved if the Fusion Splicer with more stable arc power. Then glue connection is used to fix the splicing point, and the minimal loss we measured is 0.14dB. The above results show that it is possible to connect the fluoride and silica fibers by using Fusion Splicer with appropriate arc power and arc time, which will make the fabrication of these splices simpler and easier to be handled.

Keywords: Splicing method; Silica fiber; fluoride fiber

1. INTRODUCTION

Fluoride fiber which is always called ZBLAN(ZrF –BaF –LaF –AlF –NaF) fiber are mainly used as active fibers in fiber amplifiers and fiber lasers, because of their low maximum phonon energy, many less effective transitions in rare-earth ions can be used, which are not accessible in silica glasses. In most applications, however, only the active fiber is made from ZBLAN fibers and therefore it is even more important to be able to connect ZBLAN fibers with standard silica fibers, but the very different melting temperatures of both glasses make the fusion splicing techniques very difficult, because the ZBLAN fiber melting temperature in the range of 300–400°C is much lower than for silica glasses, which is around 2100°C. Another difficulty arises from the fact that ZBLAN fiber change from solid to liquid phase in a very narrow temperature range. So connecting ZBLAN and silica fibers by fusion splicing always needs special setups.

In this paper, by decreasing the arc power and choosing the optimal arc time, we use the FSM-20PM ARC Fusion Splicer for joining fluoride and silica fibers. The experiment results show that it is possible to connect these two fibers by using Fusion Splicer with appropriate parameters.

2. PARAMETERS OF FIBERS AND THE FUSION SPLICER

Silica fiber been chosen is India NM36 fiber, and Fluoride fiber been chosen is ZBLAN fiber fabricated by Institute of High-Frequency Engineering, Technical University at Braunschweig, Germany. The parameters of the above two kind of fibers are as follows,

- **NM36 fiber**: India fiber; Dcore=4.27µm; Dcladding=125.79µm; NA=0.12; \(n_\text{core} = 1.4615\); Loss=30dB/km @635nm; MFD=4.59@635nm; MFD=5.57@830nm.